

Scaling Back

... on water impurity

One South Australian company is helping growers fight pipe scale and corrosion as well as salinity impacts with an innovative water technology conditioning system that uses radio frequencies to dissolve mineral build-up.

By **CHRISTINE BROWN-PAUL**



Scale is an accumulation of calcium, magnesium or iron inside pipes. When these compounds crystallise to form scale, plants downstream can suffer due to the lower levels of essential minerals.

For many growers, scaling can pose significant challenges. Elements usually associated with limestone or iron oxides are often dissolved in the irrigation water source. Using this water for irrigation without treatment for calcium or iron can lead to scaling and ultimately, plug emitters or even irrigation system pipes.

Calcium is dissolved in water originating from groundwater aquifers, which are formed from limestone. Once brought to the surface, the calcium enters the irrigation system and may precipitate in the tubing or around and in emitters as calcium carbonate if the concentration is high enough or if the water pH changes.

Scaling caused by iron is more difficult to deal with than scale formed by calcium. Within the irrigation system itself, iron scaling can reduce flow in pipes and clog emitters. When iron concentrations exceed 0.3 ppm, staining and scaling conditions exist.

Scale can be a frustrating problem for growers and farmers. The build-up on water pipes means that the essential nutrients in the water are not available to the plants, as well as restricting water flow.

Sonic solutions

Australian-made and owned, Hydrosmart is an innovative, computerised water conditioning system, which has 17 years' of application around Australia. Rapidly gaining a reputation around the world, Hydrosmart offers an environmentally friendly water treatment approach to solving problems of salinity, scale, hardness, algae and odour—without the use of chemicals and requiring no maintenance.

Hydrosmart's technology incorporates some of the latest advances in particle physics research. It uses computer generated resonance frequencies focused in the flow via antennae wound in tight coils around the treated water pipe. There are no flow restrictions.

According to Paul Pearce from Hydrosmart, the system offers a simple and effective solution for growers seeking to improve water quality and plant growth.

"In the world of sustainable need this is a truly outstanding water conditioning technology that simply yet effectively solves most problems caused by bonded minerals in water," Paul says.

"Hydrosmart's simple bond-breaking approach means growers are able to convert a problem across to an advantage. When minerals that are causing problems in water such as scale become resonated by the frequencies they will actually become more readily able to be taken from inorganic unavailable form to an available organic form just from the treated water itself, thereby lowering fertiliser requirements as well.

"This simple plug and play technology often gets self-installed by consumers of many types and immediately works to resolve seemingly intractable problems—especially useful in remote hard-to-get-to locations and for those seeking to not use reverse osmosis but wishing to provide good plant growth from poor quality water sources," he says.

"The system generates unique frequencies to provide a

scientifically proven, consumable free solution to a wide range of real water issues."

The types of areas tackled by Hydrosmart include:

- salinity and corrosion management (ability to irrigate using saline water without crop, plant damage)
- scale removal and prevention from pipes, plumbing, infrastructure
- water softening without chemicals or conventional water softeners
- iron removal and prevention from pipes, sprays, drippers and all surfaces in continuous water contact
- increased yields and flavour (scientifically documented as well as anecdotally confirmed)
- improved plant growth with less fertilisers by taking what are otherwise scale forming minerals in hard water sources and converting to plant friendly nutrient instead.
- water clarity improvement.

Rigorous testing

Hydrosmart is now in its third year of a rigorous scientific R&D program.

"Scientific quality control at Hydrosmart is ongoing and rigorous. The technology itself hails from particle physics research originally started overseas, which we have expanded on recently," Paul says.

So how does it work?

"Briefly, Hydrosmart targets the charged compounds that are present in solution, including dipolar substances. Parts of many molecules and elements that are dissolved in water are either positively charged or negatively charged, and the electrical fields produced by Hydrosmart act on these charges. The result is bond breaking in the case of transient bonds. Additionally, by opposing bond formation, Hydrosmart maintains substances in a dissolved state for a longer time than they are in the absence of Hydrosmart," he says.

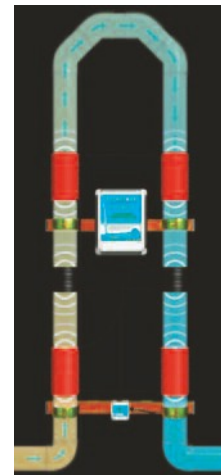
"Electrical fields are modulated in Hydrosmart by means of computer-chip controlled circuitry. Precise resonance frequencies are produced, which result in the bond-breaking effects."

In a recent series of trials, it was shown that plants grown with Hydrosmart did well, while those grown without Hydrosmart actually died. The 2011 study showed that Hydrosmart makes the calcium in borewater available as a nutrient, making plants stronger and healthier so more able to cope with challenges.

The tests—conducted at Suntec Labs NZ—revealed dramatic improvements in plants grown in bore water. In fact, the plants grown using bore water without Hydrosmart technology were more prone to die due to salinity.

During the Suntec Lab trials, it was demonstrated that Hydrosmart vastly reduces the likelihood of plants perishing because of high salinity levels. Lettuces grown in Hydrosmart treated water were able to survive in water with a salinity of 6000 ppm. In comparison, normal tolerance for hydroponic lettuce is only 800 ppm.

Similar results have also been



achieved in tests involving truss tomatoes, with plant growth and fruit quality both showing dramatic improvements with the Hydrosmart system.

The hydroponic study showed that plants are able to deal most effectively with minerals that are fully dissolved. Hydrosmart was shown to increase the bioavailability of fertiliser while keeping the filters cleaner and lowering maintenance.

Flinders University published results from Hydrosmart's calcium particle trial, saying:

"The technology 'Hydrosmart has here been shown to have physical effects on the kinetics of mineral precipitation from an aqueous solution. Under the influence of ULF and VLF electromagnetic field modulation, calcium carbonate nuclei were greater in number (showing as a turbidity increase), and lesser in size, than in untreated control systems."

"In another trial (run in 2010) on lettuce of two varieties, we had the lettuce grow out to end of the trial in water at 10,000 EC in the treated triplicate channels. Compared with this, the untreated lettuce channels died out at just two weeks into the trial, which was designed to push the plants to failure in high salinity water—mimicking poor quality Australian bores. The dye trials in the lettuce in rainwater show also that there is far better transpiration," Paul says.

"We have run a series of eight triplicate growth trials over the last three years on lettuce and tomatoes, testing benefits of treatment in high levels of salts. We have recorded an increased yield of up to 15% with 5% brix increase in triplicate channels growing beefsteak tomatoes compared to the untreated control and recorded the differences in yield and brix when using our new ranges of frequencies," Paul says.

New trials are already underway with more planned.

"The R & D phase over 2014-2015 has both chemistry and physical trials scheduled that are and will be running in South Australian and Victorian universities over this time to better understand chemical impacts and establish the ability of specific ranges of frequencies for specific projects with new patents applied for both here and overseas," Paul says.

Applications and benefits

According to Paul Pearce, the Hydrosmart system offers benefits for many applications and not just for those seeking solutions to salty water.

"The Hydrosmart system offers benefits for growers, glasshouse growers, farmers, irrigators who have bore water with high salinity, scale and iron issues. It provides solutions for those needing to solve these types of problems and it also offers the added benefits of better growth outcomes and crop health," Paul says.

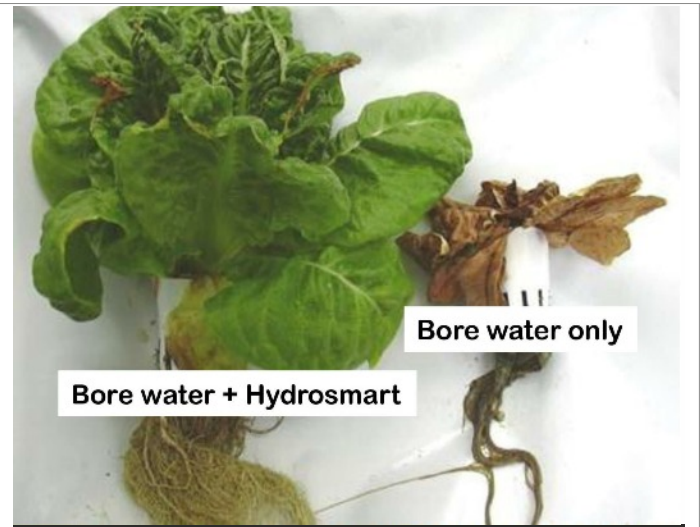
Hydrosmart conditioning units have been installed at the Ballarat Golf Club in Victoria and more recently for an apple grower in the Harcourt Valley south of Bendigo.

The bore at the orchard produces almost 11,000 litres of water per hour, enough for the 20,000 trees, but with 2800 ppm, it was too saline to use safely.

"The owners were very close to ordering a reverse osmosis plant before they found out about us," says Paul.

"That would have cost almost \$80,000. Instead, we were able to sell them an 80mm unit for around \$8000.

"And now they will get to use all the water from the bore.



Butterhead lettuce (bore water). Lettuce grown in Hydrosmart treated water were able to survive in water with a salinity of 6000 ppm. In comparison, normal tolerance for hydroponic lettuce is only 800 ppm.



Butterhead lettuce in Hydrosmart treated rain and bore water grew better fresh weights than untreated in trial.



Red Frill harvest lettuce in Hydrosmart treated rainwater and borewater grew better fresh weights than untreated water in trial.



Paul, Bob and Brian from Hydrosmart's consultant team with the Hydrosmart system.

Reverse osmosis produces a briny water waste by-product that in this case would have been 45% of the total output," he says.

So what benefits can the system offer growers?

"The system offers increases in yield, increases in flavour by better nutrient uptake at the root xylem and lower health issues in plants," Paul says.

"Hydrosmart technology can turn problematic scale in pipes into healthier plants by ensuring calcium and iron deposits are bioavailable. By installing the technology on water infrastructure to de-scale the pipes, hydroponic farmers can benefit from healthier plants and better yield and flavour."

There are also savings in energy and costs.

"All it takes is five watts power to run, hence, around \$10 annually in power to increase one's crop. That makes good commercial sense," he says.

"It also provides the capacity to grow commercial crops in salty bore, river or dam sources without the need for reverse osmosis in brackish sources.

"There is also an increase in readily available minerals in water that, once bonds have been broken, are much more plant-friendly as nutrients while osmotic pressure of salts does not stop the roots from being able to drink in the required water and minerals for healthy plant growth," Paul says.

Have there been any challenges in bringing the system to market?

"We found that it's taken a long time for growers to understand and accept that, by using particle physics and a small amount of electrical power, Hydrosmart's simple bond-breaking approach means they are able to convert a problem across to an advantage," Paul says.

"Hydrosmart's frequencies resonate and impact on minerals that are causing problems in water—such as scale—actually making them more readily able to be taken from inorganic unavailable form to an available organic form just from the treated water itself. This also lowers fertiliser requirements.

"As demonstrated by years of research as well as evidence from practical applications across Australia, Hydrosmart technology helps turn scale into bioavailable nutrients, as well



(Clockwise from top left) Lettuce in trials, olives grown in high salts, centre pivot with units fitted, grape growing.

as keeping pipes and filters clean and reducing maintenance needs," he says.

"Investing in a Hydrosmart solution makes good business sense."

More information at: www.hydrosmart.com.au

About the author

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