



Nursery & Garden Industry
Queensland

Reverse Osmosis Systems

The most significant raw material to the human race is water. Water in its clean, uncontaminated and unpolluted form is colourless, odourless and tasteless. However, in nature pure water is not commonly found. Ninety seven percent of all the earths' water is located in the oceans and polar ice caps, with only a small fraction (0.65%) available for use by humans domestically and industrially. Pure water will not conduct electricity and therefore will not have a total dissolved solids (TDS) or an electrical conductivity (EC) reading. Almost all natural waters contain different types and quantities of impurities, even rainwater, depending on location, may contain carbonic acid, nitrogen and/or other industrial pollutants.

As plant roots are restricted to the growing media in each container for their water and nutrition requirements, water utilised for container production should be of a consistent high quality with few contaminates. Excessive levels of some elements in the irrigation water source such as iron, manganese, calcium, magnesium and chlorine can react with any applied plant nutrients causing production losses. Some of these elements can also impact on surfaces in the production system producing scale and staining.

All water used for irrigation in nursery production should be laboratory tested before use, and monitored throughout the production cycle to ensure its suitability. A laboratory water test or analysis will identify the elements present, and express their volume as parts per million (ppm) or milligrams per litre (mg/L). This water analysis can

be interpreted against accepted nursery production water quality parameters. (see Nursery Paper: 'Water quality and nursery crop nutrition' for more information or contact NGIQ for technical support).

Water that is often unsuitable for nursery production can be improved with a custom designed water treatment system such as Reverse Osmosis (RO). RO systems can be used to eliminate excess salinity, total dissolved solids, heavy metals and microorganisms that are sometimes found in brackish, surface and underground water supplies.



RO is an effective and proven technology to produce water that is suitable for nursery production with some post treatment. RO uses a cross filtration system with two streams. One stream is the product or permeate passing through a semi-permeable

reverse osmosis filter membrane, and the other stream the reject water or brine directed away, creating sufficient turbulence to reduce contaminate build-up on the reverse osmosis membrane surface.

The reverse osmosis membrane rejects contaminates based on their size and ionic charge, allowing the passage of water molecules, but not the majority of dissolved salts, organics, and bacteria. RO works by using a high pressure pump to force the poor quality water across the semi-permeable reverse osmosis membrane, leaving almost all of the dissolved salts in the reject

stream. The more concentrated the source water, the greater the pressure required.

RO systems for nursery production are best designed to provide the required water quality slowly over as long a time period as possible. High flow rates can be costly. However, processing the source water over an extended period of time and then transferring into tank storage for later use is considered cost effective.

Pre-treatment of the source water is crucial to continued trouble free operation and will be recommended by any reputable RO supplier. Media and micro-filtration systems are often the required pre-treatment, particularly for brackish surface water supplies, to reduce cleaning and maintenance costs and prolong the life of the reverse osmosis membrane.

Wastewater from the RO system must be managed, and depending on the quality of the source water, can typically be up to twenty five percent of the input water. In some local government areas restrictions may exist for the management of this wastewater.

Water that has passed through the RO system, the product or permeate, is very corrosive and is commonly blended with other source water before use in nursery production. Growers have also found using only permeate water for nursery production can produce soft plants and, in these cases, blending micro-filtration water with post-reverse osmosis treated water (back blending) can be used to produce better quality plants.

RO systems for nursery production should be supplied and installed by professionals. These RO systems are generally self-contained, stand-alone units ready for plumbing and electrical connection. Prior to any agreement to purchase, the supplier should ensure a full laboratory analysis is undertaken of the source water, and obtain details of the water volumes required by the nursery.

When investigating an RO system growers should be aware of the:

- capital and installation costs (including plumbing and electrical requirements)
- daily water requirement
- required water quality
- wastewater volumes and disposal options (including government regulations)
- operational costs e.g. electricity
- maintenance costs e.g. service contracts, RO membrane replacement
- storage requirements e.g. tanks
- final blending requirements
- monitoring systems
- failsafe and backup systems

System design, scheduled maintenance, pre-treatment, monitoring and service support is crucial to ensuring continued trouble free operation of the RO unit preventing costly repairs and unscheduled maintenance.

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