

Design of a hydroponic system: Closed System

Technical information sheet No. 2

1

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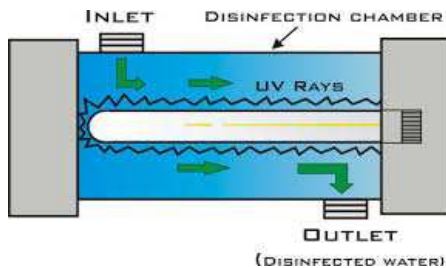
Recirculation

A closed system means that all drain water is collected and being used in the same crop. It will save up to 50% water and 60% fertiliser. But:

- If raw water contains Na, SO₄, Cl, HCO₃ and B in levels higher than plant uptake they may accumulate to toxic levels. Therefore hydroponics require high quality water.
- In some stages of growth plants may use more or less of one or the other nutrient. Therefore correction in the nutrient recipe is required (analyse each 14 days).

Disinfection unit

Recirculating water can distribute diseases so it must be disinfected. Cleaning by Ultra Violet light is very effective. Heating is effective too but generally more expensive. Slow sand filtration is acceptable for small nurseries.



Filters

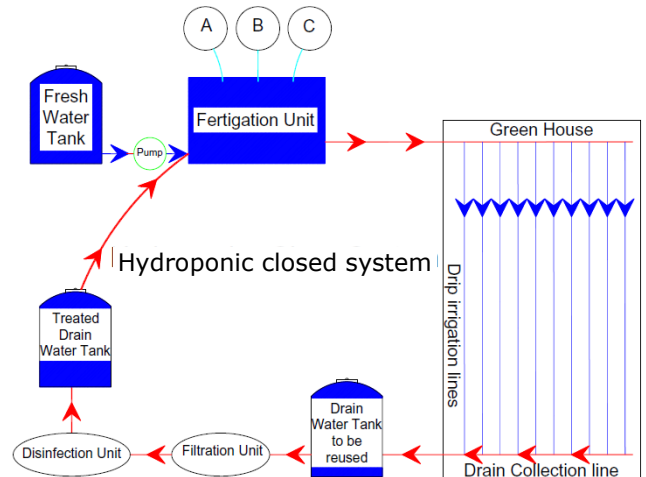
Before any disinfection unit the drain water must be treated with a filter of <60 um to eliminate coarse particles in the solution. Filters are also necessary to prevent blocking of drippers.



Storage tanks

Storage tanks for non-treated and treated drain water are necessary to allow:

- Proper steady supply to the disinfection unit.
- To mix a steady ratio of drain into irrigation water.
- To supervise and measure recirculation.



Recipes for open and closed systems

Recipes for open or closed system differ because roots can only take up enough Calcium and Magnesium if there is a high level of Ca and Mg in the rooting medium thus:

- A recipe for open system contains more Ca and Mg.
- A recirculation recipe has a;
 - start solution (for 14 days) with higher Ca/Mg.
 - cultivation schedule with low Ca/Mg to prevent accumulation in the rooting medium.

Operational control

It is important to know what is going to happen before it affects the plants. Therefore measure:

- Daily drain (litres): 30% is recommended.
 - <20% means some plants are too dry.
 - >40% means unnecessary pumping and loss of fertilizer and water.
- Daily EC and pH of the drain water
- Once per 14 day analysis of the composition of supply water and drain water

The trends in the measured values tell how to adapt.

