



HOW TO GUIDE

Harvesting unused RO water

Reverse Osmosis (RO) is used in many Irish hospitals to produce ultra-pure water for a number of different functions including sterilisers for endoscopes and theatre instruments as well as for dialysis. RO provides an essential service in hospitals but, by its nature, wastes significant quantities of water. This How-to Guide provides an outline of the different steps to consider when assessing the potential options for saving or reusing wasted water from you RO plant(s).

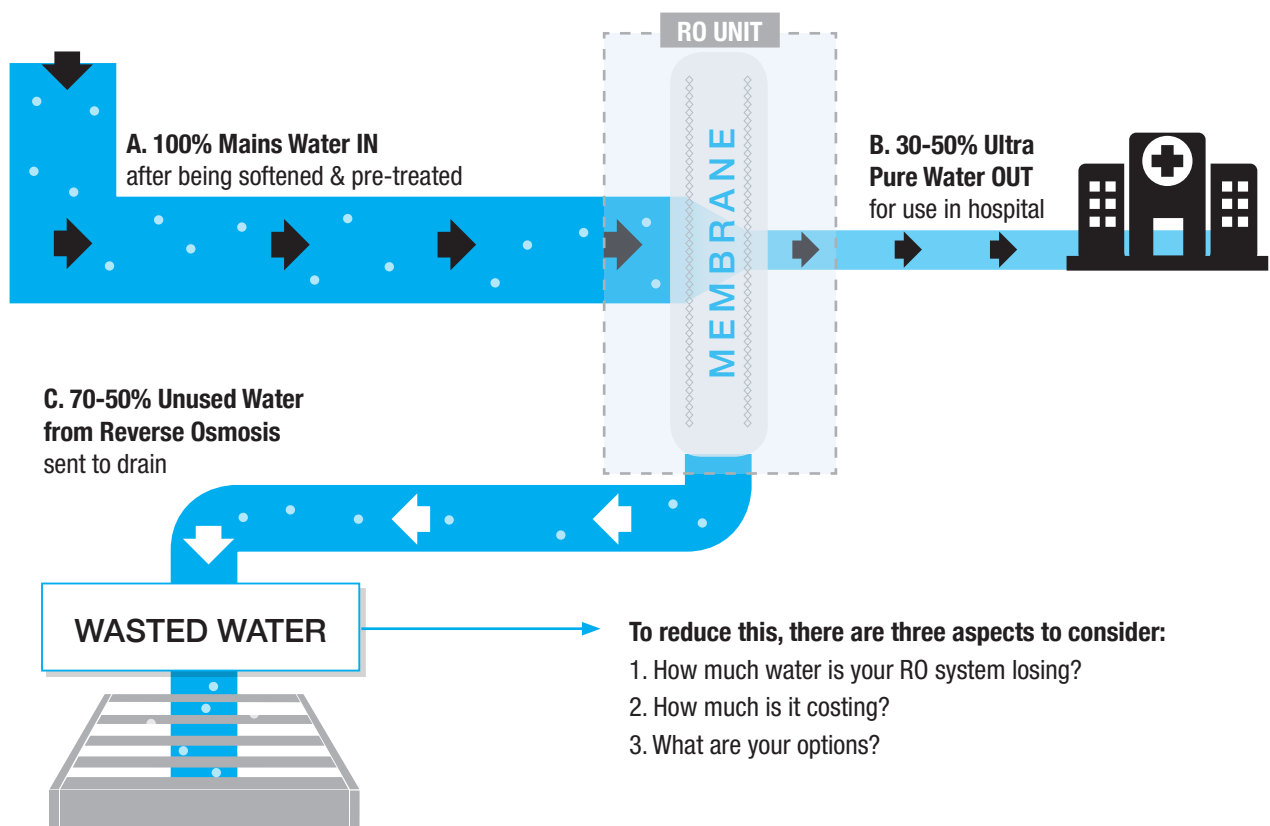
How RO Works

Reverse osmosis takes clean mains water and forces it, under pressure, through a semi-permeable membrane to remove low levels of impurities (e.g. salts). The ultra-pure water produced is used for essential hospital services.

Typically, of the water that goes into an RO unit, only 30-50% becomes ultra-pure water. The remainder, between 70-50%, is unused and usually discharged to drain. This is a significant waste of resources as this water is clean and, in many cases, has already been pre-treated.

There is great potential to reduce the costs associated with lost water from RO units, either through internal recycling, or re-use of the water elsewhere within the hospital. While the financial savings can be significant it is important to first ensure that the cost benefit of doing this makes sense.

Water flows in an RO unit





1. How much water is your RO system losing?

The first thing to find out is how much water your reverse osmosis unit(s) are losing to drain.

Contact the installer/supplier

The most straight forward way to get this information is by contacting the installer/supplier of your units. They should be able to provide you with estimates of the volume of water discharged to drain based on time in operation (e.g. m³ discharged per hour). It is important to remember that these will be estimates and the most accurate way to get volumes of water wasted for your machines are actual measurements.



Take Measurements

Actual measurements can be more difficult, depending on access to pipes and how your machines are set up. If you can get access to the unused discharged water, then it may be possible to measure it directly. If not, then it can be sub metered or calculated.

Most RO machines track how much ultra-pure water they provide. Therefore by measuring the supplied water (usually by using a clamp on meter or dedicated sub-meter) then the unused water discharged to drain can be calculated. Otherwise a temporary sub-meter can be fitted to directly measure the unused discharged water.



2. How much is it costing?

In order to calculate what the unused water is costing your hospital annually, follow this calculation:

$$\text{m}^3 \text{ per hour} \times \text{€2.50* per m}^3 \times \text{Hours of use per day} \times \text{Days per week} \times \text{Weeks per year} = \text{COST PER YEAR}$$

It is important to note that not all of this water may be recoverable but this will give you a good indication of the level of savings possible.

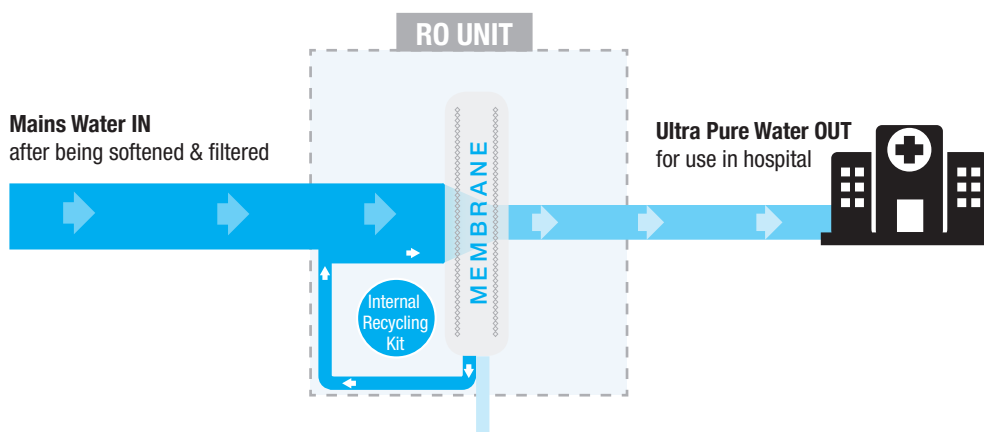
* The cost of water per m³ varies throughout the country. For the exact cost in your area go to <http://www.greenhealthcare.ie/topics/water/>



3. What are the options?

There are two options you should consider: internal recycling within the RO unit and external reuse within the hospital.

Internal Recycling



The first thing to consider is whether the efficiency of your existing system can be improved by adding an internal recycling unit. These units take some of the discharged water and reuse it internally. This reduces the total amount of water used by your RO unit for the same rate of production of ultra-pure water. However there may still be significant volumes of water discharged to drain.

Most newer units already have these included, though many older RO plants often do not. Internal recycling units are type specific and your supplier should be able to provide this option. In the past manufacturers did not include these high efficiency kits as standard as they cost extra and marginally reduced the quality of the purified water.

CASE STUDY

The CSSD unit in one Irish hospital was fitted with a machine specific internal recycling kit. This halved the incoming water consumption from 1000 litres/hour to 500 litres/hour. While the water conductivity increased from $9\mu\text{S}$ to $11\mu\text{S}$ this was still comfortably within the specified limit of $20\mu\text{S}$.

Cost Benefit:

Internal recycling unit installation: €800

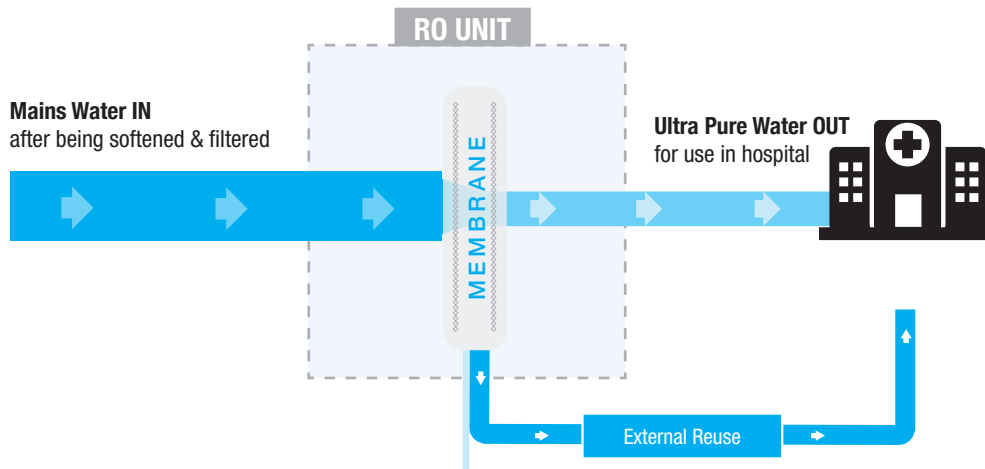
Annual savings: €2,400

Payback: 4 Months

Note: The extent of the success of such kits is dependent upon many factors including raw water quality, hours of use, etc.



External Reuse



Once you have calculated how much water is being discharged to drain, and what it is costing your hospital annually (remember to re-do steps 1 & 2 if you have installed an internal recycling unit), then reusing this water externally elsewhere in the hospital may be a cost effective option. The water discharged from RO units has usually been filtered and pre-treated prior to entering the RO unit so can be very good quality. This is a valuable resource that can be reused in other parts of the hospital with significant potential cost savings.

There are many potential uses for the saved RO water and the specific use within any hospital will be site dependent. Some potential uses include:

- Separate sluice system
- Toilet flushing water supply
- Boiler water feed
- Main water holding tank

In order to externally reuse the discharged water from any RO unit it is essential that the project is thoroughly investigated. This may include testing the quality of the discharged water, designing the additional plumbing infrastructure, costing the savings, etc. Throughout this process it is important to include all relevant hospital staff (e.g. Estates, Finance, Infection Control) so that any potential issues can be addressed while also providing information on the potential savings achievable.

CASE STUDY

One Irish acute hospital identified through sub-metering that 25% of all water supplied to their hospital was being used by their dialysis RO unit. It was found that 50% of this water was going to drain, unused. After investigating all options, and including infection control in the design process, an external reuse system was put in place. The water is now used in their dedicated sluice system.

Cost Benefit:

Initial planning and plumbing infrastructure: Over €10,000

Annual savings: €12,500

Payback: 10 Months