Reverse Osmosis - C Series

The Basics

Reverse osmosis is a process that is used to remove a wide range of salts to give water of a high purity. Osmosis is a natural process involving fluid flow across a semi-permeable membrane barrier. It is the process by which nutrients feed the cells in our bodies and how water gets to leaves at the top of trees. If you seperate a solution of salts from pure water using a basic thin semi-permeable membrane like a sausage skin, the pure water passes through the membrane and tries to dilute the salt solution. If the salt solution is connected to a vertical pipe then the progressively diluted solution will fill the pipe until the osmotic pressure drawing the pure water through the membrane is the same head pressure as the diluted solution.

This process can be reversed, hence 'reverse osmosis' - by applying a higher pressure to the salt solution. Pure water will then pass the other way through the membrane in a process that is easy to visualise as 'filtration' where the filter will only let through the smal water molecules and retain almost all of the other molecules. This means that water containing a high level of natual salts can be purified without the need for chemical regenerants such as the acid and alkali used in demin plants.

Reverse osmosis is therefore considered a much safer route of producing pure water for many commercial and industrial applications, and additionally the plant doesn't need to be taken out of service for regeneration as a demin plant does.

Rejection rates of salts from water is generally in the region of 95-99.5% dependant upon the membrane type used and the raw water feed quality. RO systems can be designed to utilise the wide range of membranes available, which will give different permeate water qualities. Standard designed RO's are manufactured using the low energy membranes which will give a permeate water quality of approx 10 microsiemens from an input water of between 500-700 microsiemens.

Reverse osmosis systems, in their most basic form, consist of a pressure pump, housing and membrane. Water is forced into the housing under pressure and the pure water (or permeate) is collected and passed to service. Reject water (or concentrate) is collected from another outlet and routed to drain, with a portion of the concentrate water recycled back to the inlet of the pump. This means that the portion of water sent to drain is kept to a minimum, allowing a recovery ratio of approx 75% to be achieved without significant fouling of the membrane. The recirculation allows a higher flow of water through the pump, reducing the load on it's bearings and keeping the pump running cooler. The recirculation on all units is adjustable.

The controller used on the RO system constantly monitors the quality of the permeate water and is also linked with safety controls on the system, to ensure the unit cuts out on low & high pressure, high & low conductivity, and full permeate tank signal. It will also run various pre and post flush cycles to maximise the life of the membranes. The constant monitoring is automatic and the programming is all pre-set to ensure protection of the system at all times and to maximise the quality of the pure water.

Pre-treatment

RO plants must be supplied with softened and de-chlorinated water. A duplex softener is recommended for continuous operation. Utilising softened water for the feed to the RO will reduce the scaling potential on the membrane and therefore lengthen it's working life. De-chlorination of the feed will reduce oxidation damage to the surface of the membrane. Membranes can also be fouled by Iron, Manganese, organics and micro-organisms. For boreholes and other private supplies a full water analysis is advised before installing an RO so that a pre-treatment system can be specified.

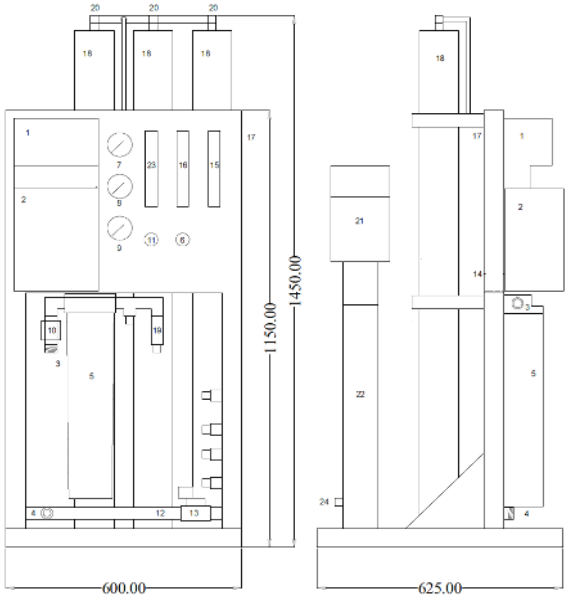
Reverse Osmosis - C Series

Technical Table

Model	ROC2000	ROC4000	ROC6000	ROC8000(3)	ROC10000(3)
Output (lph)	300	600	900	1200	1600
Input (lph)	400	800	1200	1600	2290
Flush volume required for start up	1200lph	1400lph	1800lph	2100lph	2300lph
Membrane type	OROM4040-1	OROM4040-1	OROM4040-1	OROM4040-1	OROM4040-1
Membrane number	1	2	3	4	4
Booster pump power (kw)	0.75	1.10	1.10	2.20	2.20
Amps	4.70	6.80	6.80	4.75	4.75
Power supply	Single phase	Single phase	Single phase	Three phase	Three phase
Inlet connection	3/4” BSP M	3/4” BSP M	3/4” BSP M	3/4” BSP M	1” BSP M
Permeate connection	1/2”OD	1/2”OD	1/2”OD	1/2”OD	3/4”OD
Drain	3/4” BSP M	3/4” BSP M	3/4” BSP M	3/4” BSP M	1”BSP M
Suggested softener	30L duplex	40L duplex	50L duplex	50L duplex	75L duplex
Delivered weight	80kg	85kg	100kg	110kg	140kg
Included pre-treatment	20” Carbon	20” Carbon	20” Carbon	20” Carbon	20” Carbon
Width x depth x height (mm)	600 x 625 x 1450	600 x 625 x 1450	600 x 625 x 1450	600 x 625 x 1450	600 x 625 x 1450

Front

Side

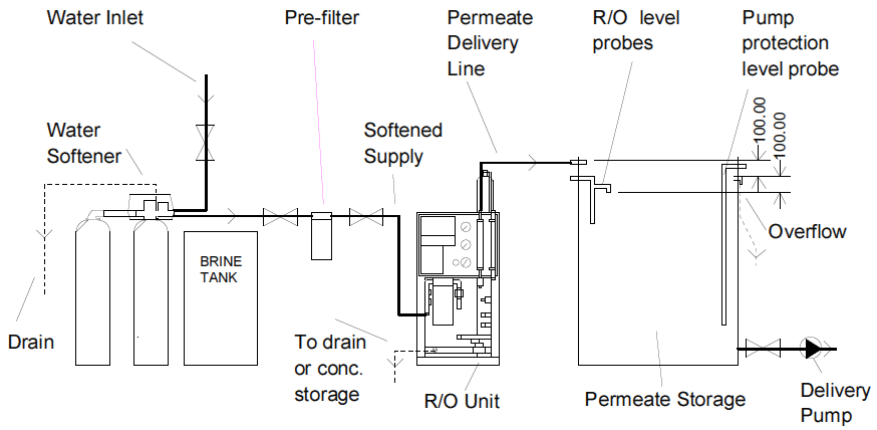


1. Controller
2. Transformer/relay
3. Inlet
4. Drain
5. GAC filter
6. Pressure control
7. Low pressure gauge
8. Pump pressure gauge
9. Back pressure gauge
10. Inlet solenoid
11. Recirc flow control
12. Flush flow control
13. Flush solenoid
14. Conductivity probe
15. Permeate flow meter
16. Concentrate flow meter
17. Permeate outlet
18. Membrane
19. Low pressure switch
20. Membrane connections
21. Pump motor
22. Pump
23. High pressure switch
24. Recirc flow meter

Site Requirements

The site requirements of an RO on site are vital for it’s sucessful operation. Apart from the RO requiring a certain quality of water, free from potential foulants, the system must be fed with sufficient volume and pressure. The flush phase of an RO requires more water than during normal service. The flush phase flow rates can be found in the table above. If the RO is starved of water during the flush phase it will shut down under low pressure in order to protect the pump.

The site should also have sufficient space to allow siting, installation and ongoing maintainence.



The diagram to the left shows a typical plumbing layout involving a reverse osmosis system. The softenened water is fed to a Carbon cartridge filter on the inlet to the C-series RO. Water is then forced at high pressure through the membranes and the resulting permeate can then be collected in the permeate storage tank. Level probes (which are included in the RO system) control the operation of the RO. A delivery pump (suitable for use with RO water) may be used to boost the treated water to service.