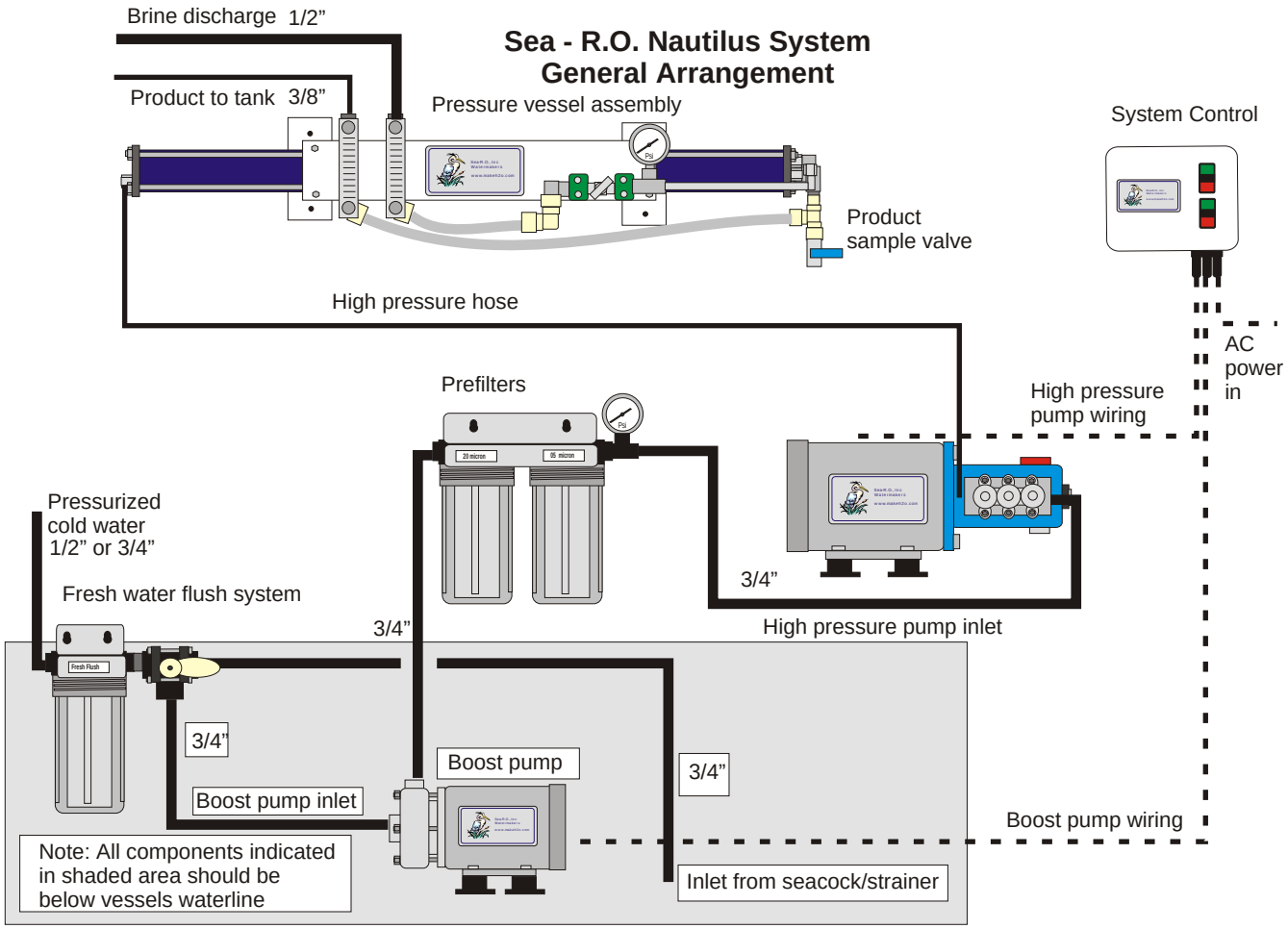
Sea-R.O., Inc. Watermakers "What's R.O."? Technology Explained

Reverse Osmosis or R.O. for short, is the process that makes it possible to desalinate seawater and reduce the salt content to levels that meet or exceed United States Environmental Protection Agency (USEPA) and World Health Organization (WHO) standards for drinking or potable water.

First of all, the term "watermaker" is not really accurate. Our equipment does not "make" water, it actually just extracts the fresh water out of the existing solution (seawater).

The membrane used in the equipment is what makes this possible. Our equipment consists of the components shown below. All watermakers work on very similar design.



Simply put, the seawater is drawn into the system by the boost pump, which “pushes” the water through the prefilters to remove any sediment or particles. The water now enters the high pressure pump and is pressurized to 800 p.s.i. The water then enters the membrane where approximately 25-30% of the flow passes through the membrane as fresh water. The remaining 70-75% flows across the membrane and is discharged continuously as brine or waste.

The above ratio of product water to brine is known as “recovery”.

The quality of the product water produced is dependent upon the raw water salinity, water temperature, and the membrane condition. It is normal for reverse osmosis membranes to last about 2-3 years and the reason for replacement is usually a gradual increase of salt passage into the product water. Ideally, membranes will reject 99.2 to 99.4% of the dissolved salts in the feed water.

This is known as “rejection”.

So, in a typical seawater application, the normal ocean salinity is 36,000 *parts per million* of *total dissolved solids.* This is referred to as PPM and TDS. If we take 36,000 and divide by 99.2%, we arrive at 362.9 PPM. This is the expected water quality which will be produced by the reverse osmosis system.

The United States Environmental Protection Association (USEPA) has established 500 PPM or lower to be the acceptable level for drinking water. In other parts of the world, the World Health Organization sets the standard at 1000 PPM or less.

From our experience and our own sense of taste, we have found that water tastes varies according to the following thresholds.

PPM level	Observation
0-500	Tastes great, no aftertaste
500-700	Tastes fine, slight aftertaste
700-1000	Tastes okay, aftertaste obvious
1000-1300	Tastes poor, aftertaste is salty
1300 and above	Tastes salty

Drinking water produced from the desalination of seawater provides some of the very best tasting and healthy water possible. The same trace elements that are found in the human body exist in almost identical ratio. Impurities and contaminants, including bacteria and virus are excluded by their sheer size. See the next page that shows a relative particle size and note that dissolved salts are the smallest of the particles. Reverse osmosis effectively excludes everything except pure water.

Seawater contains over 70 different elements, but 6 make up over 99% of all the dissolved salts.

Chloride (Cl):	19,700 ppm or 55%
Sodium (Na):	10,800 ppm or 30%
Sulphate (SO4):	2,800 ppm or 8%
Magnesium (Mg):	1300 ppm or 4%
Calcium (Ca):	410 ppm or 1%
Potassium (K):	390 ppm or 1%

97% of the earths water is saltwater, 2% is in ice, leaving only 1% available as drinking water.

“All of us have in our veins the exact same percentage of salt that exists in the ocean and therefore we have salt in our blood, in our sweat, in our tears”.
“We are tied to the ocean and when we go back to the sea, we are going back from whence we came”. President John F. Kennedy

ST Microscope	Electron Microscope	Optical Microscope	Human Eye
Ionic Range	Molecular	Macro Molecular	Micro Particle	Macro Particle

Microns

0.001 | 0.01 | 0.1 | 1.0 | 10 | 100 | 1000

Relative particle size of common materials

- Dissolved Salt
- Virus
- Bacteria
- Yeast Cells
- Beach Sand
- Pollen
- Colloidal Silica
- Giardia
- Human Hair
- Pesticide
- Coal Dust
- Herbicide
- Milled Flour

Process for Separation

- Reverse Osmosis
- Nano-Filtration
- Ultra-Filtration
- Micro-Filtration
- Conventional Particle Filtration