Manufacturing and Fabrication Overview
For SIG Desalination Systems

Summary

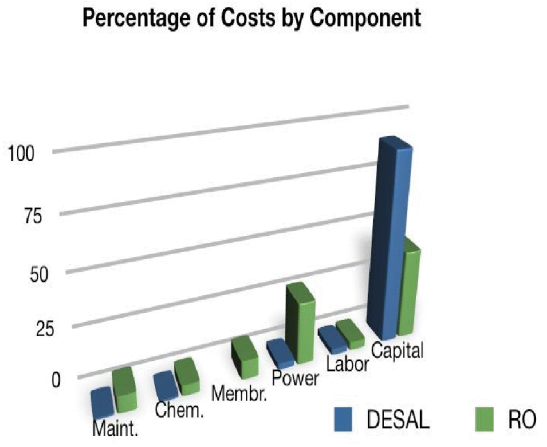
SIG desalination technology requires very little power while increasing output flows by two orders of magnitude. The design totally eliminates the need to dispose of brine, making it the most environmentally favorable method for desalination. Simply put - lower energy, much lower maintenance, greater output, no harm to the environment.

SIG desalination system "black box" desalinates both brackish and sea water. Around the black box is a fabricated tank system which also manages output of solids removed from the water. Desalination units start at a base configuration using twin 17,500 gallon tanks, both designed for redundancy, eliminating downtime. A standard, modular six-tank system can output a total of 5 million gallons per day (MGD) of potable water (33,250 GPH per module). The flow thru recovery rate is approx. 95%. Larger systems are built in multiples of modules (2 tanks per module) scaling from 1 MGD up to any configuration. Typical commercial plant sizes are for 50, 100 and 500 MGD.

Comparison of Reverse Osmosis (RO) and SIG

Sample desal 1 MGD output	RO	DESAL
Membrane Replacement Cost	15%	None
Flow Thru rates	30%	~95%
Brine disposal	70%	None
KW per kilo-gallon @ $US 0.05/KWh	$ 0.85	$0.03 – 0.08

Current desalination plants using reverse osmosis (RO) require large amounts of electricity and maintenance to support high-pressure flows. DESAL systems use very small amounts of pressure, very little electricity for process flow, and comparably need little maintenance. DESAL partially works on the principle of electrodialysis, but of a very different nature than the systems currently sold (GE for example).



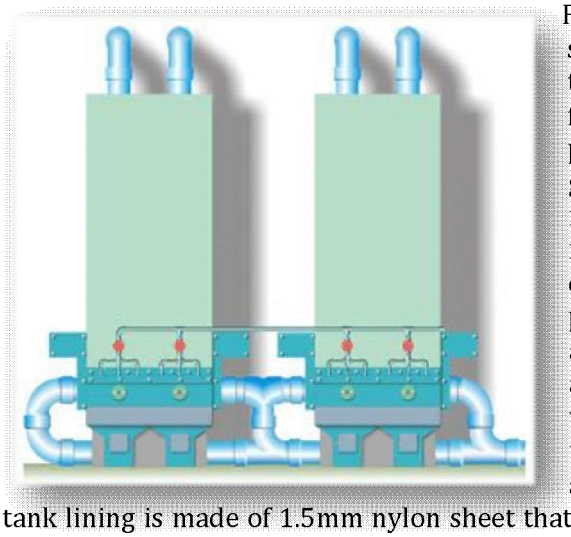
%	Maintenance	Chem.	Membrane	Power	Labor	Capital
DESAL	1	1	0	3	3	92
RO	8	5	9	30	4	43

DESAL preciptates salts and minerals, and uses ultrasound to separate out heavy metals from the inflow. At the end of each cycle these byproducts are pushed from the tanks as solids, not as brine. From an environmental perspective, ***DESAL technology has a major advantage of returning no brine.***

In terms of flow thru rates RO units return 50% to 95% of their intake water back out to the source. The high-salt concentration outflow has at least a 10°C higher temperature, potentially very devastating to the environment.

SIG DESAL *eliminates* brine output and *recovers* more than 95% of the input flow as potable water.

Design

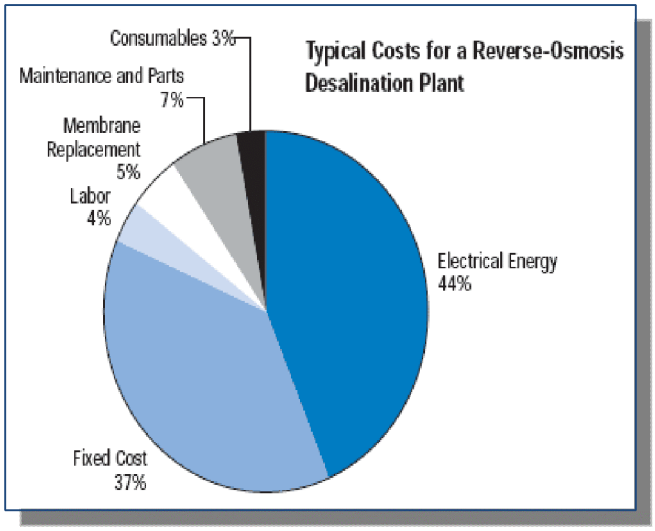


Fabrication of the outer tank is quite straightforward and intended to be done at the installation site or in a local fabrication facility. Each tank is 6m x 4.5m x 2.5m, and processes and outputs a minimum of 17,500 gallons per cycle per tank. Each cycle is 30 minutes, with allowance for one 30-minute maintenance cycle per day. Therefore, 47 cycles yields a minimum of 822,500 gallons per tank per day. The outer tank and braces are fabricated from standard 4mm sheet aluminum in order to prevent corrosion that would lead to failure. Other materials can be used, but may reduce the lifespan of the system or not be as economical. The inner tank lining is made of 1.5mm nylon sheet that is bonded to be water-tight. Two such tanks are shown below. Fabrication details are supplied to each contracting party. Piping materials are the same as used in conventional desalination plants. All of the materials above are standard, available industrial products.

The "black box" desalination engine and controls require high-precision manufacturing and is always handled under the strictest terms of confidentiality. A Lego-like approach is used for ease of manufacturing. Each tank requires a set of many desalination "bricks." Each brick is less than half a cubic foot, and is made by standard plastic injection molding using a special quality of plastic. The brick has hundreds of metal alloy components that are attached to the plastic brick. Our proprietary metal units are formed in metal injection molding machines. Robots are used for precision attachment of metal components in the brick to assure quality control of critical tolerances and avoid premature failure. Other materials used are listed in the table below. Because the injection molding machines are quite standard equipment, there are no particular limitations to manufacturing once the Intellectual Property is known. Manufacturability is guaranteed.

Material Inputs		**Plant List**
- in-house components	*- outsourced components include: Valves, Pipes, Ultrasonic unit, Motor assembly,process control, timer, filter, standard fixtures and fittings*	Plastic injection molding line and appropriate tooling
Metals for dielectric		Metal injection molding line and appropriate tooling
Plastic (injection)		Assembly robots for attachment of molded metal components
Plastic (sheet)		QA equipment (voltage, water testing, inspection cameras, etc.)
		Assembly line conveyors and other standard manufacturing support equipment

Efficiency



All deployed desalination methods remain an expensive solution to water scarcity when compared to natural water resources.

Current RO desalination output costs are ~ $2.08 per kGal ($0.55/m^3).

Of this cost, the largest is for electricity, with 17kW required per kGal, or $0.85 @ $0.05/per kW.

The greatest challenge for the industry is increasing desalination energy efficiency faster than increases in electricity prices.

- DESAL reduces energy required for desalination by at least 80% to $0.07 per kGal.
- Additional energy savings are realized in eliminating the pumping of brine back to the feed source. Electricity costs are reduced by 11% and capital costs by 4%.
- Brine elimination improves output rates by 200% when compared with RO systems.
- Total dissolved solids (TDS) are reduced from current standards of 10-500 parts per million (PPM), to 10-50 PPM TDS.
- Conversion to solid salts and extracted metals also provides an economic benefit for industrial use.