

## **Desalination Process and Salt Management**

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With serious water resources sustainability challenges worldwide, low energy desalination process combined with renewable water could be the answer. What is desalination?

Desalination is the process of removing salt from water to make it suitable for drinking, agriculture or industrial uses. Today, Desalination plants are used to convert sea water to drinking water on ships and in many arid regions of the world, and to treat water in other areas that is fouled by natural and unnatural contaminants.

Below are some types of desalination process:

- 1- Distillation: salt water is heated on one container to make the water evaporate, leaving the salt behind. The desalinated vapor is then condensed to form water. This requires high fuel consumption.
- 2- Flash distillation: same concept as distillation, however in order to reduce fuel consumption, a vacuum will be used to lower the boiling point or by exposing a water spray or film to high heat.
- 3- Electrodialysis: the use of porous membranes to filter out negatively and positively charged salt ions;
- 4- Freezing, based on the principle that water excludes salt when it crystallizes to ice;
- 5- Reverse osmosis, in which pressure, generated by the presence of salt in the water, forces water through a membrane permeable only by pure water.
- 6- Geothermal desalination: under consideration, this will use geothermal heat as source of energy.
- 7- The solar humidification-dehumidification method (HDH): this process mimics the natural water cycle, but over a much shorter time frame.
- 8- Seawater Greenhouse : This technique involves pumping saline water to an arid location and then subjecting it to two processes: first, it is used to humidify and cool the air inside a greenhouse, and second, it is evaporated by solar heating and distilled to produce fresh water.

Today, desalination impact and disadvantage could be summarized to: 1) physical destruction to the marina, by sucking organisms living within the vicinity of the desalination plant; 2) generation of solid salt waste 3) generation of liquid waste (high salt concentrations, chemical use during defouling of plant equipment and pre-treatment, toxic metals) with waste usually discharged to the ocean or sent to wastewater treatment plants or dried out; 4) the use of fossil fuels and thus contribution to the increased levels of greenhouse gases; 5) the use of large amounts of energy as well as specialized, expensive infrastructure, making it very costly compared to the use of fresh water from rivers or groundwater.

Investigating and developing the geothermal, HDH and seawater greenhouse desalination process in addition to solar, wind, or other alternative energy process could be the real answer for future water scarcity challenges. Let's hope that technology and politics in the coming years will be directed to address the impacts of this process and make water treatment more affordable and manageable.

**Reference:**

<http://en.wikipedia.org/wiki/Desalination>

[http://www.arvanitakis.com/en/sw/desalination\\_process.htm](http://www.arvanitakis.com/en/sw/desalination_process.htm)

<http://ga.water.usgs.gov/edu/drinkseawater.html>