

Desalination as a Water Purification Technique

Desalination is a very interesting process that scientists have devised to turn undrinkable sea water into drinkable fresh water. Desalination is a big word so let's break it up into smaller parts to better understand it. "De-" is the first part of the word which means undo or remove. The next part of the word is "-sal-" which means salt. The last part of the word is "-ation" which means a type of process or procedure. If you put all of these parts together we can better understand what desalination actually means. Desalination means removing the salt, in this case from water, through a specific process which is described below.

The process by which desalination occurs can be seemingly simple yet is very complicated. Since salts easily dissolve into water it becomes very difficult to remove them from a solution state. The salts are not in an aggregated solid form. Instead the very physical structure of the way their atoms form molecules has changed – Sodium (Na^+) and Chlorine (Cl^-) have broken apart while dissolving, and are surrounded by water molecules due to water's polarity. Desalination first uses a system of pumps and valves to run seawater/saltwater into cylindrical chambers. These chambers contain "membranes" that are actually advanced polymer films that have micro-pores only big enough for water molecules (H_2O) to go through. By applying a huge amount of pressure and force in the chamber, water is able to travel across the film while leaving undesired salts behind. The water then travels through other chambers which further purify and filter the water until it is just like freshwater.

Though this is an interesting and useful technology there are some problems with it. This technique requires the use of very expensive facilities and equipment that are necessary for the filtration of the saltwater. The pumps that are used and the special types of filtration "membranes" are some of the most costly part of this technology. Another problem with desalination is that it requires a great amount of energy to work. If you recall to the step with the pumps and the "membrane" (reverse osmosis), a huge amount of energy and pressure is needed to force the water molecules through the "membrane" while preventing the salt and other particles from getting through. This means that desalination plants can't be set up in places where there is no readily available source of continuous energy. Unfortunately, some of the places in the world that would need desalination lack the energy source and money. Perhaps the last main problem with desalination is the waste product that it creates. If all of the clean water is sent to homes and tanks for storage what happens to all of the salt and dirt particles that were removed from the salt water? The answer is that in most cases it is actually sent back into the ocean. In other cases the salt is purified through other techniques and is sold as "sea salt."

Sources :

- Water Desalination- RO Reverse Osmosis Plants
http://www.youtube.com/watch?v=u54T7hbR_R4
- Desalination Plant Diagram
http://www.seawater-desalination.jp/english/tsds_a002.html
- Article on the Pros and Cons of Desalination
http://www.theecologist.org/News/news_analysis/269784/desalination_pros_and_cons_of_a_typically_thorny_issue.html