

## DESALINATION... from [www.usgs.gov](http://www.usgs.gov)

### Thirsty? How about a cool, refreshing cup of seawater?

Humans cannot drink saline water. But saline water can be made into fresh water, which everyone needs every day. The process is called desalination, and it is being used more and more around the world to provide people with needed fresh water. Most of the United States has, or can gain access to, ample supplies of fresh water for drinking purposes. But fresh water can be in short supply in some parts of the country and world. And, as the population continues to grow, shortages of fresh water will occur more often, if only in certain locations. In some areas, salt water (from the ocean, for instance) is being turned into freshwater for drinking.

What do we mean by saline water? Water that is saline contains significant amounts, referred to as concentrations, of dissolved salts. In this case, the concentration is the amount (by weight) of salt in water, as expressed in parts per million (ppm). If water has a concentration of 10,000 ppm of dissolved salts, then one percent (10,000/1,000,000) of the weight of the water comes from dissolved salts. Ocean water contains about 35,000 ppm of salt.

Here are our parameters for saline water:

Fresh water - Less than 1,000 ppm

Slightly saline water - From 1,000 ppm to 3,000 ppm

Moderately saline water - From 3,000 ppm to 10,000 ppm

Highly saline water - From 10,000 ppm to 35,000 ppm

Source: Saline-water resources of North Dakota, USGS [Water Supply Paper 1428](#).

### The worldwide need for freshwater



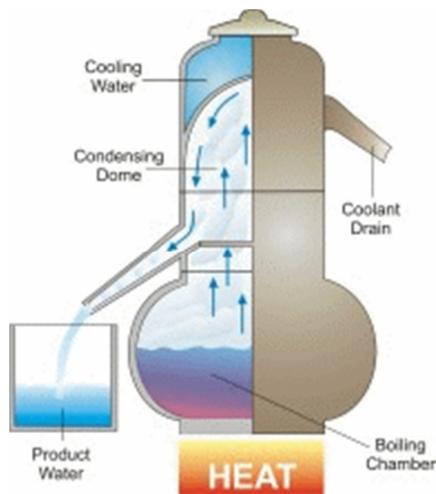
Jebel Ali Desalination Station, Dubai

The scarcity of fresh water resources and the need for additional water supplies is already critical in many arid regions of the world and will be increasingly important in the future. It is very likely that the water issue will be considered, like fossil energy resources, to be one of the determining factors of world stability. Many arid areas simply do not have fresh water resources in the form of surface water such as rivers, lakes, etc. and have only limited

underground water resources that are becoming more brackish as abstraction of water from the aquifers continues. The world-wide availability of renewable energies and the availability of mature technologies in this field make it possible to consider the coupling of desalination plants with renewable energy production processes in order to ensure the production of water in a sustainable and environmentally friendly scheme for the regions concerned. Solar desalination is used by nature to produce rain which is the main source of fresh water on earth. All

available human-made distillation systems are duplication on a small scale of this natural process. Recently, considerable attention has been given to the use of renewable energy as sources for desalination, especially in remote areas and islands, because of the high costs of fossil fuels, difficulties in obtaining it, attempts to conserve fossil fuels, interest in reducing air pollution, and the lack of electrical power in remote areas.

## Desalination is not modern science



Desalination/Distillation is one of humankind's earliest forms of water treatment, and it is still a popular treatment solution throughout the world today. In ancient times, many civilizations used this process on their ships to convert sea water into drinking water. 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. Distillation is perhaps the one water treatment technology that most completely reduces the widest range of drinking water contaminants.

In nature, this basic process is responsible for the hydrologic cycle. The sun causes water to evaporate from surface sources such as lakes, oceans, and streams. The water vapor eventually comes in contact with cooler air, where it re-condenses to form dew or rain. This process can be imitated artificially, and more rapidly than in nature, using alternative sources of heating and cooling.

The above diagram and information is courtesy of Desware: The Encyclopedia of Desalination and Water Resources.

Some of this information came from the Water Education Foundation and from the Corpus Christi TAMU-CC Public Administration.

## Some desalination facts

- It is estimated that some 30% of the world's irrigated areas suffers from salinity problems and remediation is seen to be very costly.
- In 2002 there were about 12,500 desalination plants around the world in 120 countries. They produce some 14 million m<sup>3</sup>/day of freshwater, which is less than 1% of total world consumption.
- The most important users of desalinated water are in the Middle East, (mainly Saudi Arabia, Kuwait, the United Arab Emirates, Qatar and Bahrain), which uses about 70% of worldwide capacity; and in North Africa (mainly Libya and Algeria), which uses about 6% of worldwide capacity.
- Among industrialized countries, the United States is one of the most important users of desalinated water (6.5%), especially in California and parts of Florida.