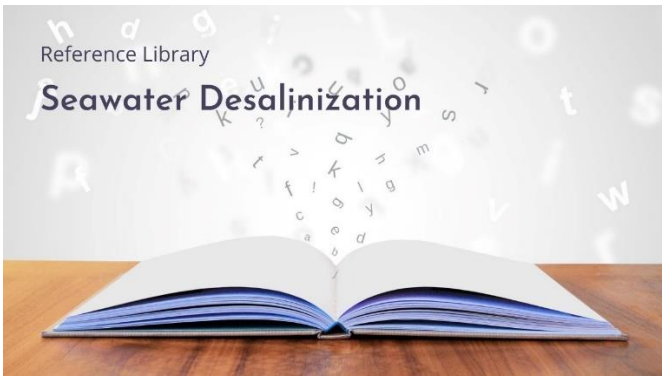

Over seventy percent of the surface of the Earth is covered with ocean water. From all available water resources, less than 3% is freshwater, and even a smaller fraction is available for potable use. On the other hand, seawater constitutes 97% of all water on Earth. However, due to its high salinity it cannot be consumed directly!

Desalination is the process of turning seawater into potable freshwater. Although uncommon in Canada, desalination is common in coastal areas with little freshwater supplies such as Australia, Japan, and the Middle East.

There are two main technologies for seawater desalination. The traditional flash distillation process, accounting for 85% of global production, boils seawater and condenses the vapour into potable water. Boiling seawater does not necessarily require high temperatures. Instead, vacuum is applied to force boiling at lower temperatures.

In recent years, an increasingly popular technology for desalination is reverse osmosis membranes. The process is commonly known as Seawater Reverse Osmosis (SWRO). The mechanism is similar to that of commercial RO systems whereby incoming water is pressurized in a membrane unit to yield essentially pure water and reject all other contaminants. The drain stream, which consists mainly of concentrated saltwater, is normally returned to the sea.

The main drawback of desalination is excessive use of energy. Boiling seawater or pressurizing it in SWRO membranes requires significant amounts of energy, which translates into increased greenhouse gas emissions. Energy-rich countries like Saudi Arabia possess significant oil and gas resources to run affordable large scale desalination operations in the Persian Gulf and the Red Sea. In fact, Saudi Arabia has 15 of the world's 100 largest desalination plants.

In the United States, the first larges scale desalination plant was commissioned in Tampa Bay FL in 2008 with a daily production capacity of 25 million gallons per day. This supplies about 10% of the water supply in the Tampa Bay area.

Another major environmental impact of desalination is disposal of concentrated saltwater drain into the sea. Many aquatic organisms and coral reef are sensitive to extreme salinity levels. Discharging highly concentrated saltwater back into the sea may disturb the natural ecosystem and cause significant damage.

Seawater desalination is a useful technology to generate freshwater in areas with scarce water resources. However, the technology may potentially cause significant environmental impacts and increased greenhouse gas emissions. Nonetheless, could it be the solution the world's water crisis in the future?

The United States' first large scale desalination plant in Tampa Bay, FL. The plant uses SWRO membranes to produce drinking water from the Atlantic Ocean.