

Desalinization

Water desalinization in the UAE aims at meeting the quantitative and qualitative needs for domestic water and drinking water, accounting for around 99% of water consumption. The process takes away all the mineral components in saline water, making it fresh. The water is either blended with groundwater or directly used. The Emirates desalinizes both ground and seawater. The ground desalinated water is mostly used for agricultural purposes while the seawater used for domestic water, especially for drinking. In the year 2008, the desalinated water accounted for 24% of water use in the entire Emirates.

Desalination remains the primary source of potable water in the UAE. The desalination plants are powered by natural gas, which contributes to a third of greenhouse gas emissions in the emirates. The desalination process remains costly and resource-intensive if the modern sources of energy are not applied in the production.

Water desalination in the Emirates has resulted in the use of renewable sources of energy. For instance, some of the desalination plants are running on solar power. This is an environmentally friendly technology that is aimed at reducing water scarcity. These technologies have reduced carbon dioxide emissions and increased the production of freshwater. The main advantage associated with these technologies is that they have zero emissions, therefore, protecting the atmosphere. The use of solar power in water desalinization has reduced the cost used in the creation of clean water. Desalinization in the emirates has been made possible by the massive revenue obtained from the production of gas and oil.

For the last few decades, desalinization of water has been facilitated innovation. Seawater Reverse Osmosis (SWRO) is a commonly used technology in the desalinization of water. The

application of this technology has shown a drop in energy consumption of four to five kilowatt-hours per cubic meter. Membranes have been developed that are operated at a better flux and high recovery. High amounts of energy are needed in the state-of-the-art desalinization. The Emirates has 33 significant plants for water desalinization. Most of these plants either use the multiple-effect distillation (MED) or the multi-stage flash (MSF). Only two of the plants employ reverse osmosis (RO) (Politano et al., 2017). These technologies use steam power from thermal plants as their primary sources of energy. Therefore, the process of water production is directly proportional to electric production, thus reaches the peak during summer when electricity production remains at a high level.

Currently, the UAE is shifting to the modern methods of water desalination with the aim of sustainable production. These methods are going to reduce carbon emissions and minimize the long-term costs used in production. Commitments are on industrial-scale advancement and sustainable technologies for desalination in order to meet the demands for clean water. The Emirates has now recognized the link between water, food, and energy by investing in cutting-edge technologies that increase efficiency and reduce the impacts of the environment by the desalination process.

In the UAE, companies have been developed that aid in desalination. For instance, Masdar, Abu Dhabi's renewable Energy Company that has a desalination programme. The company obtained a mandate from the Emirates capital leadership to develop and demonstrate desalination technologies to reduce both water scarcity and energy consumption. The objective of this programme is to increase access to water in the arid areas. The launch of the Abu Dhabi desalination programme is likely to increase water consumption per person from 550-629 liters per person in a day. The programme costs 2 billion dollars within a period of five years. The

UAE has eight seawater desalination plants that are operated by joint ventures. The ventures are collaborations between the government and other private companies that are allowed own 40% of the shares. They are commonly referred to as the Independent Water and Power Producers (IWPP).

The desalinated water is usually available at low costs making it easy to meet the industrial water demands for the industries, have shown the willingness to pay for water at higher rates compared to those of agriculture and domestic rates. Studies have shown that the desalinization of seawater requires ten times more energy compared to that used in surface water.

The desalinization process for seawater has been attributed to various shortcomings. When the brine is pumped near the coast, the salinity of water around the Gulf increases. This is likely to impact negatively on the coastal environment, therefore, increasing the rates of water scarcity in the future. Desalinization is also associated with chemicals such as the anti-fouling agents that are later released to the sea (Rahman et al., 2019). This leads to the death of aquatic animals such as crustaceans, the small fish, among other life-forms. Other studies conducted in the inland storage ponds of UAE show that the deposited brine has the possibility of seeping in the underground water sources affecting their quality.