FRESH WATER PRODUCTION TECHNOLOGY

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Seawater desalination technology is becoming increasingly mature, and solar-powered desalination systems are being deployed in a growing number of regions.

The portable solar desalination device primarily uses reverse osmosis technology. High pressure forces seawater through a membrane with extremely small pores, removing dissolved salts and minerals and making the water safe for drinking. Compared to conventional reverse osmosis systems, the energy source is shifted from grid-based electricity to solar energy.

The system typically consists of solar panels, a desalination unit, and storage tanks for purified water. The solar panels generate electricity to power the desalination process, and the produced clean drinking water is stored in a tank until it is needed.

The solar desalinator is designed to be easily transported and installed in various locations. These devices are particularly useful in areas with limited access to clean drinking water, such as remote areas or during natural disasters.

There are several types of solar-powered desalination plants that are used to obtain fresh water from seawater or brackish water. These plants are designed to be portable and can be used in various conditions, including remote locations or places that are not connected to the power grid.

The principle of reverse osmosis using solar energy:

1. Pretreatment: Before the reverse osmosis process begins, seawater is typically treated with sediment filters and chemicals to remove any suspended solids or other contaminants that could clog the reverse osmosis membranes. This step is known as pretreatment;

2. Primary treatment: Pre-treated seawater is then fed into the reverse osmosis system via a feed pump. The pump pressurizes the seawater and pushes it through a series of reverse osmosis membranes. Reverse osmosis membranes are thin semi-permeable sheets made of a special material that allows water

molecules to pass through but blocks larger contaminants such as salt and other dissolved minerals;

3. Collection: When seawater with a high salt concentration passes through a reverse osmosis membrane, the extremely small pore size separates the water into two streams, namely purified clean water and concentrated water. Purified water is collected on one side, while contaminants remain on the other. It is also known as concentrated brine because it contains concentrated contaminants;

4. Post-treatment: Although water after RO treatment has achieved a high degree of purity, purified water may still contain a small amount of dissolved contaminants. The post-treatment process is added after the RO equipment, typically using chemicals or other processes to remove any remaining impurities in the purified water. Therefore, this step is also called post-treatment.

5. Disposal of concentrated brine: Concentrated brine produced during reverse osmosis is usually disposed of in an environmentally safe manner, for example, by pumping it back into the ocean at a depth where it will not harm marine life.

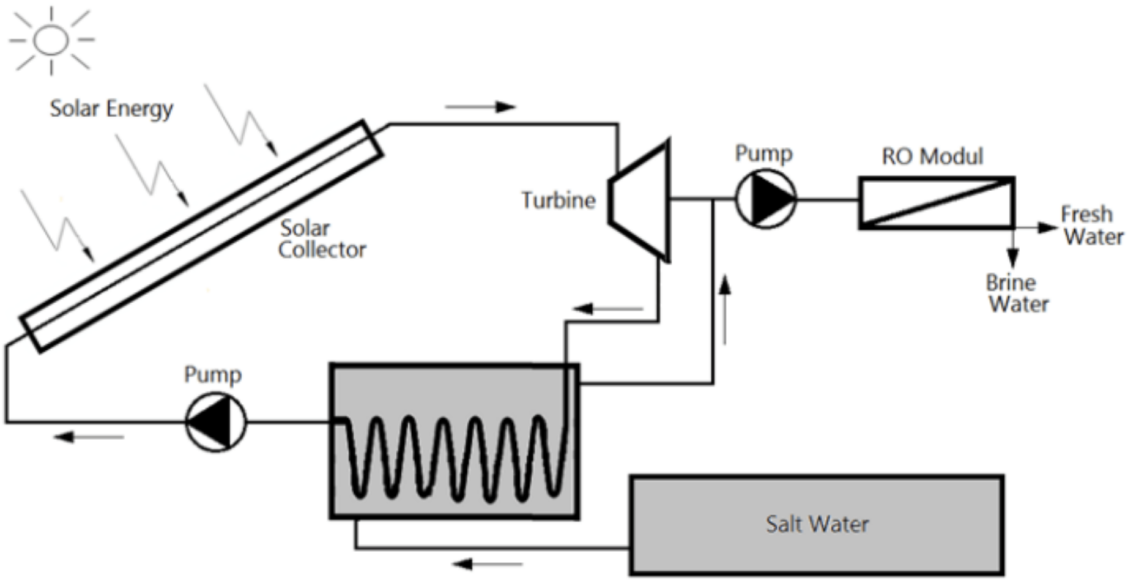

Fig. 1. Solar-powered distillation system

A solar distillation system uses solar energy to heat seawater or brackish water, which is then evaporated and collected as fresh water. This type of system is typically more expensive and requires more maintenance than a solar distiller or solar-powered reverse osmosis system.

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