MODERNWATER

Manipulated Osmosis Desalination

Real-World Solutions

Modern Water's patented process consistently delivers significant reductions in energy use, reducing opex and reliably producing high quality product water, even in the most challenging conditions.

MOD PLANT, AL KHALUF *AUG 2010*

KEY ADVANTAGES OF MANIPULATED OSMOSIS DESALINATION PROCESS:

- Reliable and robust membrane process
- Energy consumption up to 30% lower than conventional reverse osmosis
- Forward osmosis membranes are chlorine tolerant and compatible with a variety of biocides
- Forward osmosis membranes are fouling resistant
- Inherently low product boron levels, when compared to conventional reverse osmosis
- Higher availability than conventional reverse osmosis plant due to low fouling and simple cleaning when required

Modern Water has successfully deployed and operated internationally their patented desalination process, operating with real seawaters in challenging environments.

Modern Water is the world leader in this technology and, as of November 2010, has the only two operational seawater plants in the world using the Manipulated Osmosis Desalination process.

The first plant is located in Europe, at Gibraltar on the Mediterranean Sea. Since commissioning in September 2008, this plant has been used for development work, and is where a number of manipulated osmosis membranes have been tested, evaluated and proven in real-world conditions. The plant has been supplying water for public consumption since 1st May 2009 and has never required membrane cleaning.

The second plant is located in the Sultanate of Oman, at an existing Public Authority for Electricity and Water seawater desalination site. Modern Water's facility shares a common pre-treatment system with the existing conventional reverse osmosis plant, which allows the two processes to be compared using identical feedwater. The plant was fully commissioned in November 2009 and has been exporting water for public consumption since that time. As of November 2010 the membranes have never been cleaned despite the very challenging feed water conditions (an open, shallow seawater intake), whereas the conventional plant has required cleaning multiple times over the same period.

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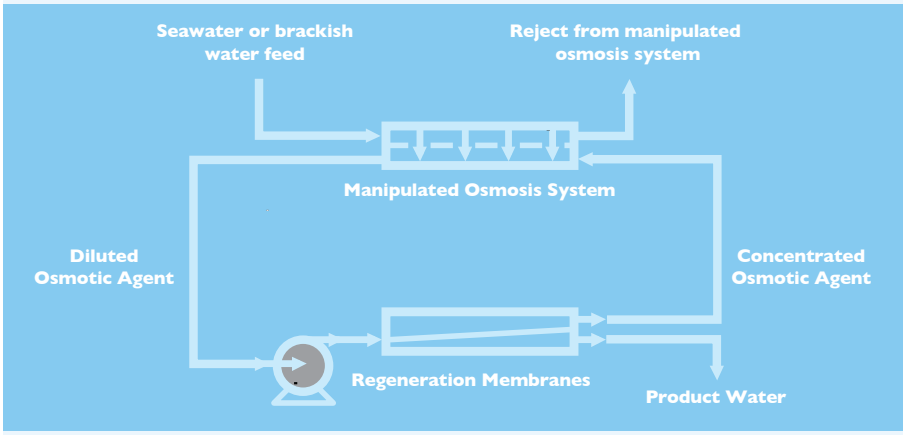
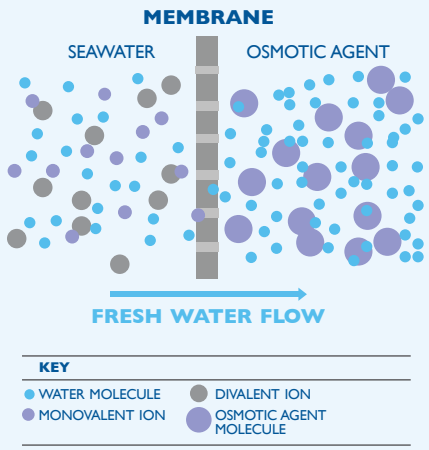
Manipulated Osmosis Desalination explained

How does it work?

At the heart of the Modern Water process is a recirculating "osmotic agent" system that transfers pure water from the feedwater (eg seawater) to the regeneration (permeate extraction) system. By linking two highly optimised systems, the manipulated osmosis system and the regeneration system, significant benefits are achieved.



EXTRACTING FRESH WATER FROM SEAWATER USING MANIPULATED OSMOSIS



In the first stage, feedwater is fed under low pressure to the manipulated (forward) osmosis membranes, which are highly resistant to fouling and are resistant to oxidising agents. The osmotic agent, on the other side of the membrane, draws fresh water from the seawater due to a difference in osmotic pressure. This fresh water dilutes the osmotic agent.

In the second stage, permeate is extracted from the system. The pure water is removed from the dilute osmotic agent which is regenerated (or concentrated) for reuse in the first stage. This can be achieved in a number of ways depending on the proprietary osmotic agent selected. Modern Water currently uses a membrane separation process, similar to reverse osmosis, to extract the fresh water.

Delivery of Benefits

The manipulated osmosis membranes are inherently less prone to fouling because only low pressures (≈ 2 barg) are applied to the membranes. This compares to conventional reverse osmosis systems, where very high pressures (≈ 82 barg) compress the foulants in the feedwater onto the membrane surface. Less pre-treatment of the feedwater is required.

A highly optimised regeneration (permeate extraction) system is possible, because the normal limitations in the process are removed by careful selection of the chemistry and operating parameters of the osmotic agent. This leads to a lower energy consumption compared to conventional reverse osmosis, and a saving of up to 30% is possible.

A lower boron content in the product water is achieved compared to a conventional plant, due to the membranes and control of the osmotic agent. This inherent capability may eliminate the need for post-treatment designed to remove problematic boron, which would otherwise increase the cost of the water produced.

MORE INFO:

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