

Hach helps largest RO desalination plant in Asia run smoothly and efficiently

Tuas, Singapore

Who is the client?

Situated on a 14-hectare site in Tuas on the western section of Singapore, this desalination plant is the largest seawater reverse-osmosis desalination plant in Asia. Construction of the plant began in 2011 and it also features an on-site combined cycle gas turbine power plant which will supply electricity to the desalination facility. With limited water supply in Singapore, a quarter of its water demand will now be met by desalinated water, with the Republic's second and largest seawater treatment plant.

With a capacity of 70 million gallons, or 318,500 cubic meters of desalinated water per day, the desalination plant marks another major step in Singapore's journey towards water sustainability. Desalination is an important supply of water for Singapore as the country has little land to collect and store rainwater.

The plant uses reverse-osmosis technology preceded by ultrafiltration pretreatment. It is one of the most energy-efficient large-scale desalination plants with one of the largest ultrafiltration pre-treatment systems for seawater desalination and a self-sufficient on-site power plant.

What is the challenge?

Being the largest desalination plant in Asia, it was difficult to gain full control for online process. The challenge for Hach was to be able to help client control their process for their online analyzing. It was to also ensure that the tested parameters, chlorine, fluoride, TOC, turbidity and oil in water would not exceed the required measurements.

What is the process and Hach's solution to client?

The plant, which uses ultrafiltration membrane technology for the desalination pre-treatment process, holds the distinction of having one of the largest ultrafiltration pre-treatment membrane installations in the world. Seawater entering the desalination plant is channeled through the ultrafiltration membranes to remove suspended solids and microorganisms. After this pre-treatment, the seawater is passed through semi-permeable membranes in a two-stage reverse osmosis treatment process to remove the salt from the water and produce fresh pure water. This water then undergoes a post-treatment process for re-mineralization before being delivered to the water authority for distribution to households and industries in Singapore.

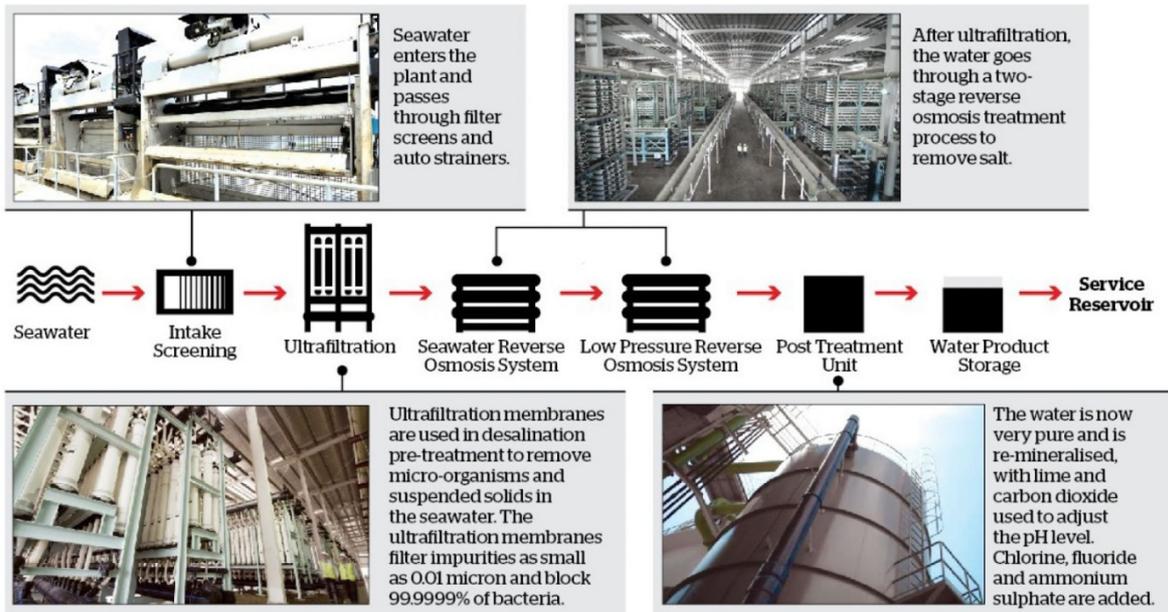


Figure 1: On-site desalination plant process diagram

Improvements in technology have lowered the costs of desalination and water reclamation, while other energy-efficiency improvements mean that the reclaiming and de-salting of water use less energy than they used to. This plant is using the latest technology, Ultrafiltration membranes, which are more effective at removing dissolved salts from seawater. The seawater is taken into the plant and goes through a two-stage reverse-osmosis treatment process where impurities and salts are filtered out by ultra-fine semi-permeable membranes that can remove particles of up to 0.01 microns in size. The filtered water is consistently of high quality and this helps boost the performance and life span of membranes used in the next step of desalination -- the reverse osmosis process.



Figure 2: Reverse Osmosis Membranes at the desalination plant, Tuas Singapore

As well as featuring one of the world's largest ultrafiltration pre-treatment systems for seawater desalination, a partially split SWRO membrane train configuration and a self-sufficient on-site power plant combine to ensure that this plant is one of the most energy-efficient large-scale desalination plants on the planet.

With that, Hach has provided a total solution to resolve client's challenges. With the Hach CL17 Chlorine Analyzer (testing for chlorine) installed at the chlorine contact tank, it could help monitor the chlorine level. Aside from that, the product tank also has a Hach 9184sc Amperometric Chlorine Analyzer (test for chlorine) installed to test for the chlorine level, and not to exceed a certain standard.

When moving on to the fluoridation of water stage, we have the Hach CA610 Fluoride Analyzer installed to test on the fluoride reading. After which, turbidity is being measured using the Hach 1720E Turbidimeter at the ultrafiltration stage. Monitoring of sea water for presence of oil is done possible with the assistance of Hach FP360 sc Oil in Water sensor with Hach controller.



Figure 3: CL17 Chlorine Analyzer at Customer's Site

Apart from the process solutions, Hach has client covered for the laboratory solutions and that includes installation of the Hach astroTOC UV Analyzer to measure for TOC parameter.

How is the end result?

In summary, Hach offers total solution for client with the solution table for list of instrumentation as follows:

Products	Application Point
Chlorine: CL17 Colorimetric Chlorine Analyzer	Chlorine contact tank
Chlorine: 9184sc Amperometric Chlorine Analyzer	Product tank
Fluoride: CA610 Fluoride Analyzer	Fluoridation of water
TOC: astro TOC UV Analyzer	Laboratory
Turbidity: Ultraturb sc Turbidimeter	Ultrafiltration
FP360 sc Oil in Water Sensor with controllers	Monitor sea water for presence of oil

Client's feedback: Client is happy and satisfied with the end results, with Hach being the solution provider, providing accurate control for the process operations.

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