

## Seawater Desalination at Rabigh Refinery

### Background

Saudi Aramco's RABIGH Refinery in Saudi Arabia wanted to install facility for 10000 TPD Seawater Desalination for the industrial use. The facility was supposed to be a BOOT (Build Own Operate Transfer) basis.

### General project description

The joint consortium of SETE & Aquatech was successful in meeting the strict guidelines of Technical & delivery requirements of the Turnkey Desalination on BOOT basis.

The two (2) 5000 m<sup>3</sup>/day Multiple Effect Desalination (MED) systems are being provided for the purpose of producing Process Water and Potable Water to Saudi Aramco's Refinery and community. The 10,000 m<sup>3</sup>/day net capacity of the Desalination Plant consists of 4000 m<sup>3</sup>/day of Process Water and 6000 m<sup>3</sup>/day of Potable Water.

The MED systems will produce high purity distillate that will serve as process water, and after remineralization, potable water. The MED systems use thermal vapor compression and are designed to the following criteria:

Seawater temperature range from 26°C to 32°C

Seawater TDS 41,500 ppm

Heating source LP Steam at 3.5 kg/cm<sup>2</sup>g minimum pressure

MP Steam to vacuum system at 17 kg/cm<sup>2</sup>g minimum pressure

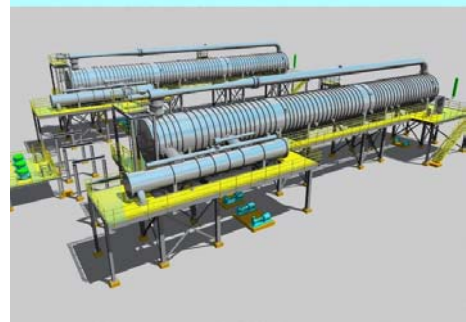
Distillate purity 5 mg/l TDS

Condesate purity 5 mg/l TDS

Design Capacity of 5000 M<sup>3</sup>/day each with turndown to 50%of design capacity.

The Plant is designed with GOR of 8 and the achieved capacity is always more than 10000 TPD with a GOR of 8.2.

### 5000 TPD MED-TC



### Process Selection

Aquatech's Multiple Effect (MED) Thermal Vapor Compression design is a multi-effect unit which incorporates SPRAY-FILM® technology, a registered trademark of Aquatech. Aquatech's MED design is the result of over 35 years of experience in the design, manufacture, start-up and operation of MED evaporator systems worldwide.

For this system, steam or water vapor condenses inside horizontal tubes. Seawater is sprayed over the outside of the horizontal tubes and acts as a heat sink for the condensing vapor. The system operates under a vacuum with a top brine temperature below 70°C. By operating at low temperatures, the heat transfer surface is less likely to scale, and the amount of heat required to bring the incoming seawater to its boiling point is minimized. This Multiple Effect plant incorporates the use of a thermocompressor to improve the thermal performance of the plant. The thermocompressor is driven by high-pressure steam, which entrains and boosts lower pressure vapors from the last effect to the moderately higher-pressure condition required in the first effect to operate the process. By recycling the lower pressure vapors from the last effect with a thermocompressor, less steam is required from an external source than if there were no thermocompressor.

Part of the water vapour from the last effect is converted to liquid form in the condenser & mixed with the seawater distillate collected from all the effects. As per the process requirements the steam condensed in the first effect is separated from the distillate & reused.

# PROJECT PROFILE SERIES #41

## MULTIPLE EFFECT THERMOCOMPRESSION DESALINATION (MED-TC)

