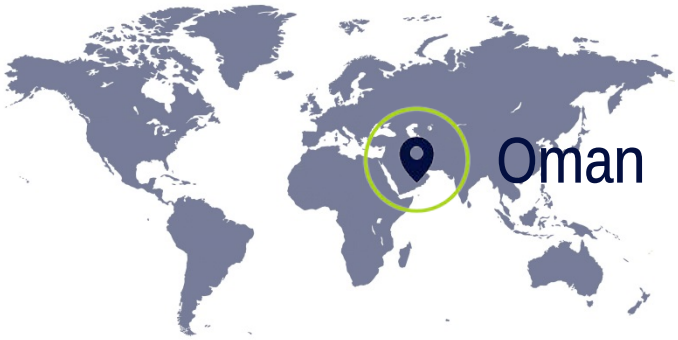
Barka II

seawater reverse osmosis desalination plant



In December 2006, Oman Power and Water Procurement Company awarded Engie, in a consortium gathering Mubadala Development and National Trading Company, the Barka II IWPP (Independent Water and Power Project) in the Sultanate of Oman.

This contract included the construction and operation of 678 MW Power Plant and a Seawater Desalination Plant with a capacity of 120,000 m^3/day.

Doosan Heavy Industry, selected by the consortium as EPC Contractor for the whole project, has entrust to SUEZ the design, build and 15 years of operation & maintenance of the Seawater Desalination Reverse Osmosis Plant.

This plant, located 50 km North West of Muscat, is an essential element for the development of the energy and water production for the main network of Oman, supplying Muscat zone.

water treatment process

Special precautions were taken to reduce the Barka seawater desalination plant's impact on the marine environment. Brine resulting form seawater filtration is recycled within the cooling system of the power plant in order to reach a seawater output quality level without any impact on the environment

seawater pretreatment : double-stage filtration

Seawater is pumped 2 km from ten seawater wells.

Two stages of Seaclean™ dual-media filter in serial

- 23 horizontal pressure filters
  - Filtration rate : 11-14 m/h
  - Filtering media : 0.55 mm sand and 1.65 anthracite
- 16 horizontal pressure filters
  - Filtration rate : 17-19 m/h
  - Filtering media : 0.30 sand and 1.95 anthracite

Safety filtration through 14 cartridges filters (5µm)

reliability
Well-proven pressure filters Bench-scale and pilot tests to fine tune operating parameters

robust Design
Successive stages of filtration to remove suspended solids, algae, plankton, etc. Operation as per seawater quality

reverse osmosis : two-pass configuration

Two-pass RO configuration

- 14 first-pass RO Trains (6 modules each)
  - 14 High pressure pumps = energy recovery turbines,
  - 12,250 seawater membranes
- 7 second-pass RO Trains (4 modules each)
  - 3.724 brackish water membranes

optimum design
Well-proven energy recovery turbine and brine re-circulated to power plant

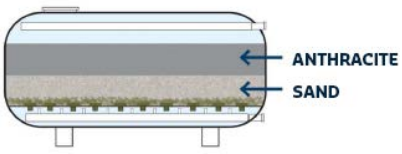
reliability
Conservative flux and conversion ration to mitigate membrane fouling risk

Seaclean™ filter

an optimized cleaning that reduce water loss

The Seaclean™ filter is pressurized horizontal filter therefore filtration occurs with a downward flow through 2 layers of media :

- Anthracite to capture suspended matter,
- Sand to reduces the Silt Density Index and therefore the risks of RO membranes fouling



post treatment

- Water remineralization for delivery as drinking water :

  the potabilization treatment includes a remineralization step, with the injection of CO2 and water lime, and fluorination.

- Final disinfection

  The final disinfection is performed using sodium hypochlorite.

high capacity pumping

Seawater pumping

- 7 pumps (Flowserve), pumping capacity 7.5 m^3/s, flow rate 3, 840 m^3/h, pressure 60 m CE, power 620 kW, power supply 690 KV, frequency converters

High pressure pumping

- 14 pumps (split casing coupled with Pelton turbine - Flowserve), pumping capacity 4 m^3/s, flow rate 1 010 m^3/h, pressure 610 m CE, power 2300 kW, power supply 11 kV, frequency converters

2nd pass RO pumping

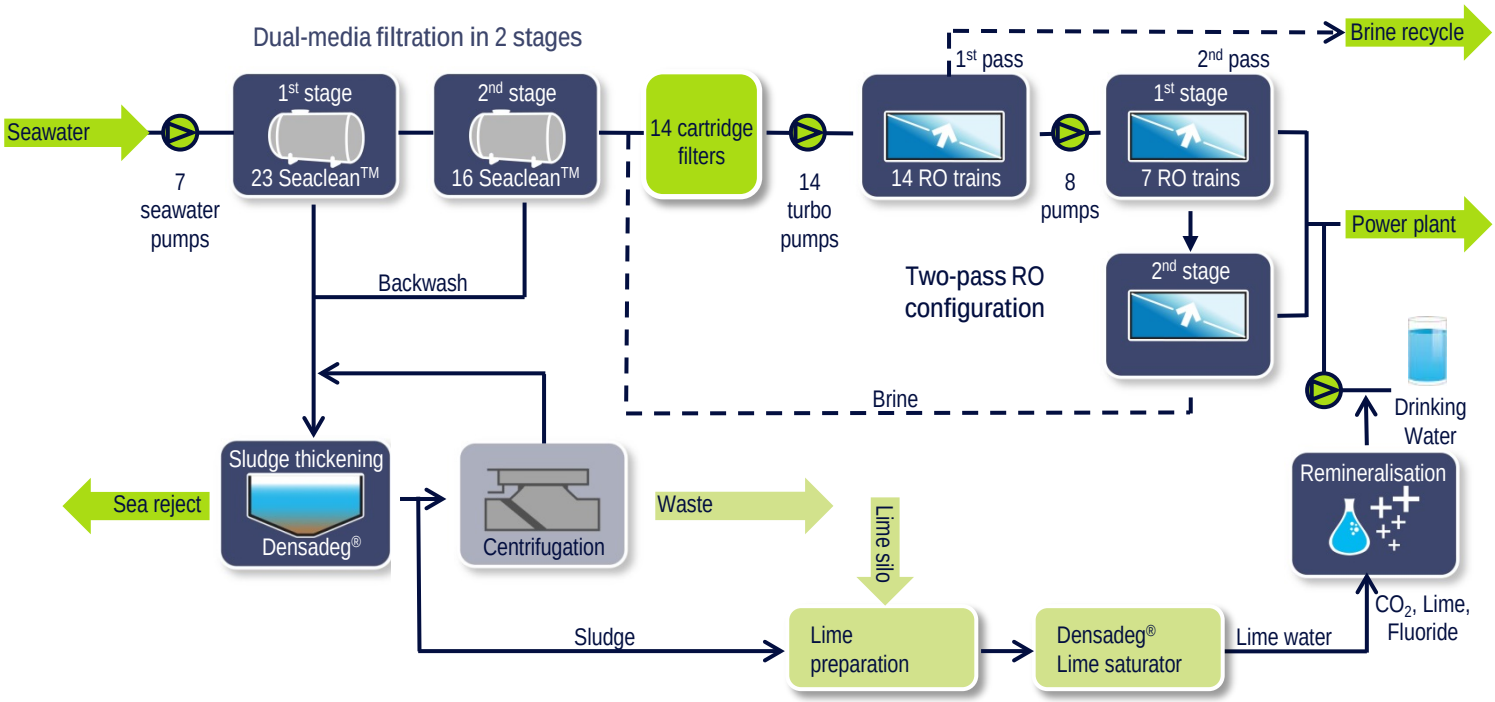
- 8 pumps (split casing – Flowserve), pumping capacity 2 m^3/s, flow rate 875 m^3/h, pressure 190 m CE, power 650 kW, power supply 690 KV, frequency converters

sludge treatment process

Disposal in the sea is minimized through dilution with the general coolant water. Furthermore the treatment of the sludge makes it possible to avoid dumping any chemical products in the sea.

- 2 **dirty waste water tanks**, capacity 450 m^3 each
- 1 **concrete Densadeg** sludge lamellar thickener
- 1 **storage tank**, capacity 300 m^3
- 2 **centrifuges** for dewatering

process diagram



characteristics

Seawater Flow	270,000 m^3/d
Seawater Salinity	37,000 – 39,000 mg/l
Temperature	25-36°C
Sea Water TSS	38-39 mg/l
TDS 1st Pass RO	530-770 mg/l
TDS 2nd Pass RO	30-40 mg/l
TDS Blended	< 45 mg/l

stakeholders

Final client :
Power & Water Procurement Co

SPC (Special Purpose Company, company responsible for executing the contract) :
SMN Barka Power

Developper & shareholder :
Engie

Other shareholders :
Mubadala & National Trading Company

EPC IWWPP Project :
Doosan Heavy Ind.

Seawater RO plant :
SUEZ (sub-contractor of Doosan Heavy Ind.) for the design, build, equipment supply, erection and commissioning supervision

Operator :
Engie-Tractebel Operation and Maintenance Oman LCC (STOMO)

dates & amounts

- notice to proceed
  2 March 2007
- substation completion date
  31 March 2009 (27 months)
- total contract value :
  49,750,000 € + 50,150,000 USD
- total SUEZ contract :
  87,734 341 €
- additional purchase order
  (spare parts) : 545,851 €

2010 Global Water Awards

For the plant commissioned in 2009 that represents the most impressive technical achievement in Power and Water.

In 2010, Engie, together with SUEZ, won the GWI (Global Water Intelligence) Power and Water plant of the year award with the Barka II reverse osmosis desalination plant.

What makes it special ?

- Barka II was the first Gulf IWPP to be tendered without a guaranteed base load capacity on the power side. This required an imaginative approach form the developer consortium
- Despite the complexity of the project, the developers were able to dig deep and work with the client to produce the best technical solution to the challenge.

guarantees

2 years after Substantial Completion Date
(+ additional 2 years warranty on a defective work within the 2 first year warrantee – maximum 6 years)

5 years on the RO membranes
depending on a Maximum Annual Replacement Rate

5 years on the RO cartridge filters (maximum replacement is 5 sets per year)

www.degremont.com

Since March 2015, all the Group brands (Degrémont, Ozonia, Aquasource, Ondeo IS, Ameriwater, Infilco, Poseidon…) became SUEZ.

Meanwhile, from now own, the technologies and know-how of our Treatment Solutions offer will be distinguished with the label degrémont®.

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