xylem
Industrial Solutions

Case Study
Treatment – Desalination

Flygt Pumps in the Alicante II Desalination Plant (Spain)

Background
Alicante is the centre of one of the largest tourist areas in Spain in the middle of the Mediterranean coast, and gets 80% of its drinking water from desalination plants.

Desalination ensures a sufficient supply of water to meet the expected growing demand of over 2 million people, which increases to 3 million in the summer season.

There are 2 plants in the south of Alicante, each with an annual capacity of 24 hm^3. Alicante II is the most modern and is located along the coastal strip between Agua Amarga and El Altet beach, near the other seawater desalination facility, Alicante I, in operation since the end of 2003.

"80% of the drinking water consumed is obtained from desalination plants."

Collection and pumping of seawater
There are basically two ways of capturing sea water for desalination: open catchment or with wells. Wells produce a better quality of incoming water, because the land acts as a filter, and they have less environmental impact.

In the initial project, this tank was divided into two zones: one for water and the other for dry installed pumps, separated by a wall. There were 7 + 1 pumps, each with a flow of 915 m^3 per hour @ 85 mca, controlled by frequency converters.

When Xylem was consulted about this solution, submerged pumps were given as an alternative.

The new facility was awarded by a consortium consisting of OHL-Inima-Alpi for the Taibilla Canals Municipal Association (MCT) on February 1, 2006.

MCT is an independent organisation, associated with the Ministry of the Environment General Directorate of Water, whose mission is to provide potable water to municipalities in a geographical area covering practically the entire Segura river valley and the southern sector of the river Júcar valley, in the provinces of Murcia, Alicante and Albacete.

The investment required for this project was about $110.5 million; 75% of which was financed by the EU Regional Development Fund.

The main arguments presented by Xylem Iberia for this were as follows:

- Digging was reduced with submerged pumps as the room to install the dry pumps, the interconnecting pipes, the stairs and access were completely eliminated.
- The wall dividing the water chamber from the pumping chamber is very expensive, because it needs to withstand the entire water pressure on just one side.

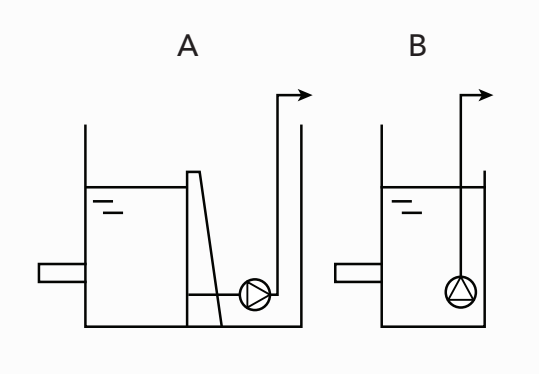
This solution was accepted after some discussion and the selection process for submersible pumps was started. This time, other companies in addition to Xylem were consulted, which offered different types of submersible pumps, some of them with special stainless steel, such as duplex or Superduplex. Xylem offered conventional pumps (CP), with zinc anodes, epoxy paint and galvanic protection.

"Xylem has a lot of experience using adequately protected Flygt pumps in seawater with excellent results."

- Xylem has a lot of experience and excellent results using Flygt pumps which are adequately protected (with zinc anodes and especially epoxy paint) in seawater, in both municipal and industrial applications, such as aquaculture.
- The use of conventional pumps widens the selection options, as they can be adapted to the specific operation of the plant while optimising efficiency in the facility.
- Using special alloys increases the price of the pumps by 3-5 times, with no other advantages apart from lower maintenance, as the anodes do not need to be replaced.
- To increase the useful life of the anodes, Xylem uses impressed current cathodic protection (ICCP), a system widely used in industrial applications, such as shipyards and buried pipelines.
- The delivery period for pumps in duplexes is much greater than that of conventional pumps. This is not only important for the first delivery, but also for each time a replacement part is needed throughout the life of the pump.
- If a duplex pump fails, only some workshops are able to repair them and they will probably lack spare parts.

In the same tank, another 2 Flygt submersible pumps (1 +1) of 72 m³/h at 20 mca were installed to empty the tank if necessary.

All pumps in this tank are protected by current cathodic protection, zinc anodes and epoxy paint.



A: Initial solution with two chambers and dry installed pumps
B: Final solution with submerged pumps

The arguments of Xylem Iberia convinced all parties (contractor, engineering company, technical assistance and end user) and, finally, 8 Flygt submersible pumps (7 +1, with space for another pump), model CP-3240.865 HT 375 kW, were installed to pump the 6,405 m³/h of seawater to the desalination plant through a pipe of 1,200 mm diameter and 322 m length.

In this project, Xylem Iberia also supplied 4 Flygt axial flow pumps, model PL 7101/865 230 kW, working at 595 rpm, protected by epoxy paint and zinc anodes, to pump seawater for the dilution of the brine from the two desalination plants (Alicante I and II) before being discharged into the sea (6 parts of seawater to 1 part brine).

The brine from both desalination plants is pumped with 3 x 90 kW Flygt pumps, model PL 7101/805, (2 of which were supplied for the Alicante I plant in 2005), all protected with epoxy paint and zinc anodes.

Finally, Xylem supplied the pumping for treated water, consisting of 3 split-bed pumps (2 + 1) of 1440 m^3/h at 110 mca controlled with a frequency variator and the cartridges that protect the reverse osmosis membranes.

Current situation

The Alicante II plant started operation in July 2008. Since then, Xylem Iberia has supervised the operation and maintenance of submersible pumps.

During this period, the current cathodic protection has worked very well by increasing the life of the zinc anodes and protecting the pumps, which have suffered no corrosion problems.

After more than a year of operation, in October 2009, a team of divers took out 2 pumps from the lower part of the tank for a complete inspection and to verify the proper condition of the pump sockets. For safety reasons, the zinc anodes are replaced every 5 months; those with the ICCP system installed are in a better state than those without this system.

Xylem is continuing research on current cathodic protection to extend the useful life of zinc anodes to at least 1 year, by adjusting the current in the system.

Project	Fluid	Supply	Delivered
IDAM Escombreras (Spain)	Sea Water (65,000 m³/d)	7 LS 350-450S1WW1 (Superduplex) 2 CAX 300-300-315 S1WW1 UF membranes	June, 2007
IDAM Alicante II (Spain)	Sea Water (68,000 m³/d)	8 CP-3240.865 HT with ICCP 4 PL 7101/865 with Zn anodes 3 VENUS 1-300/650	March, 2008
IDAM Alicante I (Spain)	Sea Water (68,000 m³/d)	3 PL 7101/805 with Zn anodes	March, 2005
SWDP Mostaganem (Alegria)	Sea Water (200,000 m³/d)	18 NCH 63-360-50-PRFV-PN-6 2 NCH 47-215-50-PRFV-PN-6 840 m² underdrains Leopold SL Dosing equipment	October, 2009
SWDP Cap Djinet (Alegria)	Sea Water (100,000 m³/d)	9 NCH 63-360-50-PRFV-PN-6 2 NCH 47-215-50-PRFV-PN-6 840 m² underdrains Leopold SL Dosing equipment	December, 2009

Tertiary treatment (Benidorm, Spain)

Desalination plant (Perth, Australia)

Desalination plant (Fujairah, UAE)

Desalination plant (Beni Saf, Algeria)