



By Danny Cameron

Two major desalination projects in Australia have become notable for the inclusion of Spanish companies in the preferred bidder consortia. With a rich history of desalination projects in their homeland, it is the first foray for the European companies into the Australian market.

Work will soon commence on the Adelaide desalination plant in South Australia, after the project received final approval last month. Multinational consortium AdelaideAqua has been named as the preferred bidder for design, construction and operation of the plant. AdelaideAqua includes two joint ventures: (1) between Spanish company Acciona Agua along with companies McConnell Dowell Constructors and Abigroup Contractors to undertake the design and construction of the desalination plant and (2) between Acciona Agua and United

Utilities Australia to undertake the operation and maintenance of the plant. Together, the AdelaideAqua consortium will design, build, operate and maintain the plant for 20 years.

Meanwhile in Western Australia, Water Corporation chief executive officer Sue Murphy announced late last year that the Southern SeaWater Alliance (SSWA) is the preferred consortium to build and operate the state's second seawater desalination plant near Binningup in the southwest. The SSWA is formed by Spanish companies, Técnicas Reunidas and Valoriza Agua along with



Cartagena II is one of two 65ML/d seawater reverse osmosis plants in Murcia, Spain, built on a 15-year design-build-finance-operate basis. The phase I plant was constructed by a consortium of Acciona Agua and Befesa. Phase II was constructed by a consortium of Acciona Agua and Degrémont.

construction company AJ Lucas and engineering consultancy WorleyParsons.

These two projects mark the arrival of companies from the Spanish water industry, and in particular the desalination industry, into the Australian market.

Maria Gorriti Gutiérrez-Cortines, the Trade Commissioner of Spain in Sydney, said the vast experience in the design and construction of desalination plants has made Spain a leading producer of desalinated water in Europe and America, as well as the largest user of desalination technology in the Western world.

Spain has over 700 desalination facilities, which all together produce more than 2GL/d. As part of a Spanish government strategy to secure more water for the country, eight large-scale desalination plant contracts have been awarded in the past two years alone as the government works to cater for its home population of 44 million residents, along with its number one industry (tourism) – predicting a further 60 million tourists spending time in the country each year. Twenty new desalination plants are currently being built along the Mediterranean coast of Spain which will more than double Spain's desalination capacity.

Gutiérrez-Cortines said: "Spanish companies now make up the largest percentage of competitors on the international arena for the design, engineering, construction and operation of new desalination plants around the world."

The Trade Commission of Spain highlighted the abilities of Acciona Agua, Aqualia, Cadagua, Cobra, Drace, Técnicas Reunidas, Tedagua, Telvent and Valoriza Agua as some of the major Spanish companies in the water treatment sector looking to get involved in the Australian market.

Spanish expertise in desalination has developed from the moment the Diaz Rijo brothers started up a multistage flash distil-

lation desalination plant – the first of its kind in Europe, on the island of Lanzarote in the Canary Islands in 1964. The government of Spain then commissioned its first large-scale desalination plant on the island in 1970 and during that decade began favouring reverse osmosis as the preferred process.

Spanish companies have since become pioneers in the use of reverse osmosis technology for the delivery of potable water, and in the implementation of new technologies in reverse osmosis facilities worldwide.

According to Acciona Agua, the proliferation of reverse osmosis technology in desalination plants in Spain makes it the most developed country in the world for reverse osmosis plants that provide water for human consumption.

It is this expertise in reverse osmosis that was cited by South Australian premier Mike Rann when he announced the preferred bidder consortium for the state's desalination project.

"The companies involved in the AdelaideAqua consortium have significant experience in constructing and operating desalination plants around the world, in particular in the application of leading edge reverse osmosis technology," Rann said.

SA Water chief operating officer John Ringham said AdelaideAqua's success in the bidding process was for reasons including the commitment to the delivery program, the quality of the technical submission, the price, the whole-of-life costs, the innovation and energy efficiency, the strong compliance with SA Water's specifications and environmental performance requirements and the ability to meet the approved risk profiles specified by SA Water.

"Equally important was the commitment of AdelaideAqua to meet the overall project program for first water delivery in December 2010," Ringham said.

The Spanish involvement in AdelaideAqua is by way of Acciona

Agua. From origins dating back to 1862, the parent group Acciona (www.acciona.es) was formed and renamed in 1997, following the merger of Entrecanales y Távora with Cubiertas y Mzov. The parent group is now one of the leading Spanish corporations, with sales of €12,665 million (A\$24,995 million) in 2008 from operations in more than 30 countries. It has a workforce of over 41,000 employees. The company states that it is a pioneer in “development and sustainability providing integrated services and products in the key areas of infrastructure, renewable energy and water”.

Acciona Agua is a branch of the parent organisation and is a “total water solutions provider with design engineering, procurement, construction and operations and maintenance experience”. Acciona Agua has been involved in over 70 reference projects in desalination worldwide, which together output a total capacity of over 1.7GL/d. It has A\$1 billion of work under construction and contracted operations revenue of A\$4.4 billion.

Ringham said Acciona Agua “brings vast experience in worldwide desalination plants and access to proven suppliers of special materials for desalination”. The Spanish company cites itself as “a pioneer in the development of reverse osmosis desalination plants, working with plants that have changed through three generations of membranes over 30 years”.

Specific desalination plants the company has been involved in include the Tampa Bay plant (Florida, US), the second largest desalination plant in the world located in Torrevieja (Spain) and the Beckton Desalination Plant which is the first desalination of brackish water in the UK.

These examples use an innovative, high efficiency (high recovery) two-pass system for the reverse osmosis membranes. Acciona Agua

said this results in lower energy consumption than the conventional system and provides significant savings in the “whole-of-life” operation cost of the plant.

The desalination community has been looking at the Tampa Bay plant in particular as an example of how to resurrect a failed project. In what is now the largest seawater desalination plant in the US, the original plant produced some water, however, the design was deficient, causing costly filters to clog too quickly. Tampa Bay Water shut down the plant in June 2005. Acciona Agua and its partner in the US, American Water, began to develop a solution to take control and remediate the failed facility. Both companies went through three years of upgrading the plant and improving the system processes. The plant has now been operating successfully for about a year.

“We think this is a piece of work that shows the reliability that we want to offer to the clients – not just on how to fix an existing plant, but to deliver quality and cost effective water for the long term,” Acciona Agua Australian development director José Maria Ortega said.

Arriving in the Australian market as a part of the team for the AdelaideAqua consortium, Ortega said: “Australia is a very interesting country for us, and moving into the market here is a strategy for the group, chiefly because it is a developed country with a safe business environment and the level of competition here is still growing. Within that, we believe we can add value.”

Entry into the water industry through the desalination project was viewed as the right opportunity because, Ortega said, “desalination is a major part of the water sector and one where we can deliver innovative, robust and cost effective solutions”.



Inside the reverse osmosis building of Cartagena I. It is one of over 700 desalination plants in Spain that together provide more than 2GL/d of desalinated water for drinking and irrigation.

He explained that no matter where in the world a desalination plant is to be built; all the plants will have unique configurations.

“Each location has its own variables including temperature, salinity, chemical composition etc, so the solution must be customised. This is one of the key success factors for us – we have over 70 references from reverse osmosis plants over the world, and these have given us a lot of experience that we have learnt from. It has given us a wider view of technical solutions that can be applied to each plant, so customising is easier.”

Ortega also said that the company has access to an extensive amount of internal research and development: “Our research capability has given us the knowledge of how waters behave in specific environments, for example at different levels of temperature, or different levels of pressure. Our research helps us find the right solution so the design is optimum.”

“We have also developed quite a few different relationships with a number of key suppliers that give us knowledge of what is around. This knowledge allows us to combine those elements and provide customised solutions to each client,” Ortega continued.

Coupling this knowledge into the design, construction and operation of the plant, Acciona Agua said a feature of the Adelaide project will be that “all the engineering is to be done from end-to-end by our inhouse engineers and local Australian engineering companies”.

Acciona Agua is responsible for the process design and has engineers now based in Adelaide, but the main part of this component is to be developed by the engineering team in Spain.

Ortega said: “We will have nearly 20 people in Adelaide and another 20 people will be involved from the offices in Spain – in

Madrid, Bilbao and Barcelona. While we are an international company, most of the experience is still held in Spain. In Adelaide we will combine all that knowledge pool with a local exposure. In the design component, the workload will be shared to make all the knowledge and capabilities transferrable.”

Complementary work and assistance to comply with Australian standards and documental control will be subcontracted to Australian engineering companies.

The construction phase of the desalination plant is expected to create around 800 jobs during peak construction activity. SA Water said there is a commitment by the AdelaideAqua consortium to recruit locally for trades, supervisors, engineers and design office staff to the extent of 75% of the resources required for the project at its peak.

SA Water said it expected that the process design, mass, energy and chemical balance diagrams will be prepared and certified overseas. The majority of detailed design, procurement specifications and drawings will be prepared in Adelaide by local teams with some supervision and oversight by process design personnel. SA Water has set project objectives to also ensure a high level of effective knowledge transfer to SA Water in all aspects of the project, including the operations phase.

“One of the things that differentiates Australia from the rest of the world is the level of involvement of the clients – from our level of experience it is much more active, which is a very good system because it will deliver a better product,” Ortega said.

The level of involvement by the client was also an important consideration in Western Australia during the selection process for the design, construction and operation of the second desalination



Inside the second largest desalination plant in the world, located in Torrevieja, Spain, and built under a 15-year design-build-operate contract by Acciona Agua. The plant delivers 240ML/d to the populace around Alicante, Spain.



A 100ML/d seawater reverse osmosis desalination plant in Skikda, Algeria, was designed, built and is now operated by a consortium featuring Valoriza Agua. The plant supplies water to a population of around 500,000.

plant for the Water Corporation.

With the experience of having already built one desalination plant in Perth, the Water Corporation has ensured that it has placed its own key people in the design and construct process by becoming a part of the alliance.

“There was a big emphasis on the level of buy-in that the Water Corporation could have as an informed client. It was an important consideration during the selection process,” Nick Churchill, project director for the Water Corporation in the Southern Seawater Desalination Project explained to *Water Engineering Australia*.

The plant will be designed with a capacity of 150ML/d (50GL/a), expandable to 300ML/d. The expansion will be a five-year option available to the Water Corporation.

In selecting the preferred bidder in the SSWA, Churchill said the Water Corporation was looking for companies that had experience in process design and construction, as well as extensive experience in the longterm operation of the plants.

As the project is being delivered by a joint venture alliance, the experience will be spread across the project, and people from each company will be involved across the board in various roles. AJ Lucas is largely considered the local construction firm with extensive water industry experience and will bring local knowledge, contracting and industrial relations to the party. WorleyParsons is the facilities engineer with experience on the Perth desalination plant, and will assist in bringing this local design context and standards to the process design.

The Spanish joint venture of Técnicas Reunidas and Valoriza Agua bring the core reverse osmosis design and construction experience, and will operate as the lead constructor. While Técnicas Reunidas has extensive experience in industrial process construction around the world, Valoriza Agua has been designing and running reverse osmosis water supply plants for many years.

“The reverse osmosis design, construct and operation experi-

ence of the Spanish is something we want brought to the fore in the alliance, and for this to be matched to the local partners,” Churchill said.

One of the lessons learnt by the Water Corporation during the development of the Perth desalination plant was the transition phase from design and construct to operation and maintenance. All partners of the SSWA design and construct phase will remain as active members of the alliance for a period of five years of plant operation. The plant, which will be owned by the Water Corporation, will then be operated by the alliance for a further 20 years.

“We believe this will ensure that whole-of-life considerations will be built-in to the project and all parties will work toward the best possible outcomes,” Churchill said.

“It was also sought that the plant would not be remotely designed, and instead be designed here in Perth so experience and knowledge could be shared,” Churchill said from the new office housing the design staff currently working on the detailed design for the project. “That was one of the attractive elements of the SSWA proposal.”

As a result, a number of Spanish designers have relocated to Perth for the project.

Valoriza Agua project engineer Marc Riera is one such engineer now based in Perth. He explained to *Water Engineering Australia*: “Valoriza Agua and Técnicas Reunidas (mother companies of Valoriza Water Australia and Técnicas Reunidas Australia, respectively) have strong design offices in Spain. Nevertheless, for big projects, we create specific design offices.

“That is the case for Southern Seawater desalination plant. We have created a design office in Perth, in which personnel from the four companies in the consortia, and from Water Corporation, form an integrated design team. Valoriza and Técnicas’ central offices in Spain will give support when required by the team in Perth.”

At peak construction, the alliance expects to have approximately



Abengoa companies Befesa and Codesa, ACS company Cobra-Tedagua and Sacyr Vallehermoso's Sadyt make up the Geida consortium, which was awarded the 25-year build-own-operate contract for the Skikda plant in April 2004.

140 people working at either the Perth design office or the site office. The workforce onsite is expected to reach close to 300 at peak construction.

Riera said that Valoriza Water Australia and Técnicas Reunidas Australia are entering the Australian market as “complete providers of water treatment plants, in procurement, design, construction and operation”.

“Valoriza was attracted by longterm expectations of the Australian water market and, more specifically, by the attractive and open conditions in which Southern Seawater desalination plant was tendered by Water Corporation of Western Australia. We hope that this contract is the beginning of a successful growth of Valoriza Water Australia in the water market,” Riera said.

Valoriza Agua, belongs to Sacyr Vallehermoso – the parent company with a turnover in 2007 of €5.76 billion (A\$11.3 billion) and a gross profit of around €1 billion (A\$1.96 billion). The company has more than 17,000 employees, most of whom are in Spain.

Valoriza Agua is currently involved in three seawater reverse osmosis desalination plants in Algeria and the second largest seawater reverse osmosis desalination plant in Spain. The Spanish plant in Águilas-Guadalestín is being delivered under a BOOT (build-own-operate-transfer) contract, with 15 years operation. The plant has the capacity to deliver 180ML/d.

The company has also built more than 40 brackish water reverse osmosis desalination plants in Spain, mainly for irrigation purposes and drinking water supply along the Mediterranean Coast, with capacities ranging from between 1ML/d and 25ML/d.

With more than 100 plants, Valoriza Agua is one of the main companies within the water technology sector in Spain.

Its Spanish partner in the SSWA is engineering specialist Técnicas Reunidas.

Chief executive of Técnicas Reunidas Juan Llado said the company largely specialises in installations for the energy industry. It is

a general contractor that provides engineering, procurement and construction services for industrial and power generation plants, particularly in the oil and gas sector. Since 1959, the group has designed and built over 1000 industrial plants worldwide. International projects account for 70% of the company's annual turnover, mainly in Latin America and China, yet this is the first foray for the company into the Australian water industry.

To date, its movement into the water industry has only been minor, with the 2007 financial report stating income of €106 million (A\$208 million) from its infrastructure branch. This is compared to Técnicas Reunidas reported sales of €2.478 billion (A\$4.85 billion). The company said it expects to maintain, and even increase, its total order books in 2009 from the €4.71 billion (A\$9.23 billion) of pending orders on its books at the end of 2008.

Técnicas Reunidas has had its own research and development division, located in Madrid, Spain since 1971. The centre is equipped with laboratory facilities featuring pilot and demonstration plants designed to be adapted to different process configurations. The research and development division focuses on developing new processes and the technological as well as economical improvement of existing ones, applying techniques and procedures of disciplines such as hydrometallurgy and electrochemistry. The company said that the fundamental objective of the division is the upscaling from laboratory testing to industrial scale operations.

Using the combined research and development talents within the alliance, the second desalination plant in Western Australia is set to become an industry leader by using microfiltration as the pretreatment option, as distinct from a dual media pretreatment process.

“This plant will push innovation in terms of the optimisation of membrane technology,” project director Nick Churchill said.

The 150ML/d plant is scheduled to be at full operation by the end of 2011. It will feature a reverse osmosis “split hybrid” innovative system, with minimised energy consumption. ●