Power to the people

In 2013, Consorci d'Aigües de Tarragona (CAT) in Tarragona, Spain, was the first water utility in mainland Europe to sign for the Aquadvanced Energy operations optimisation software from the Smart Water division of Suez.

One of Spain's newest and most modern water utilities, CAT had been wrestling with a seemingly insoluble problem. Despite investing more than 70 million euros in a completely state-of-the-art storage, distribution and network management system, efficiency savings were being wiped out by skyrocketing electricity prices.

CAT's mission is to leverage the latest technology to deliver high quality and consistent supply – at a good price – to its consortium owners, comprised of 63 towns and cities and 27 major industrial customers in the Tarragona area stretching along 200 km of coastline south of Barcelona. CAT serves around 700,000 people via 403 km of water transmission mains, 42 service reservoirs containing up to 400 ML of treated water plus an additional 180 ML of raw water storage. Twenty-three pumping stations with an installed capacity of 32.5 MW distribute water sourced from the canals of the Ebro River and treated at the L' Ampolla treatment plant located to the extreme south of the network. Drinking water represents 60 percent of delivered water with the balance consumed by large commercial customers in Tarragona province including BASF, Repsol, Dow, Bayer and Ercros, a nuclear power plant.

"We had to take action – and fast," says CAT's maintenance department chief and energy manager, Andreu Fargas Marquès. Electricity costs had jumped from two million euros in in 2005 to five million euros in 2012.

"Energy is huge for us," he says. "It represents 30 percent of our average annual cost of operations and is the single biggest cost item in our annual budget. By far the biggest energy demand is from pumps. We can't avoid pumping. All the water we use is pumped."

A pilot project at a single pumping station provided a glimmer of hope. The pilot showed that by switching to the real-time electricity market, and scheduling pumps to work during times when electricity demand – and cost – was lowest, significant savings might be possible.

But how to manage the risk and how to scale from a single pumping station to the entire network? Spain has high wind generation capacity, but when the wind drops electricity demand is made up by expensive alternatives such as gas, combined cycle and coal power plants. Could real-time pricing be an unacceptable risk if the wind doesn't blow?

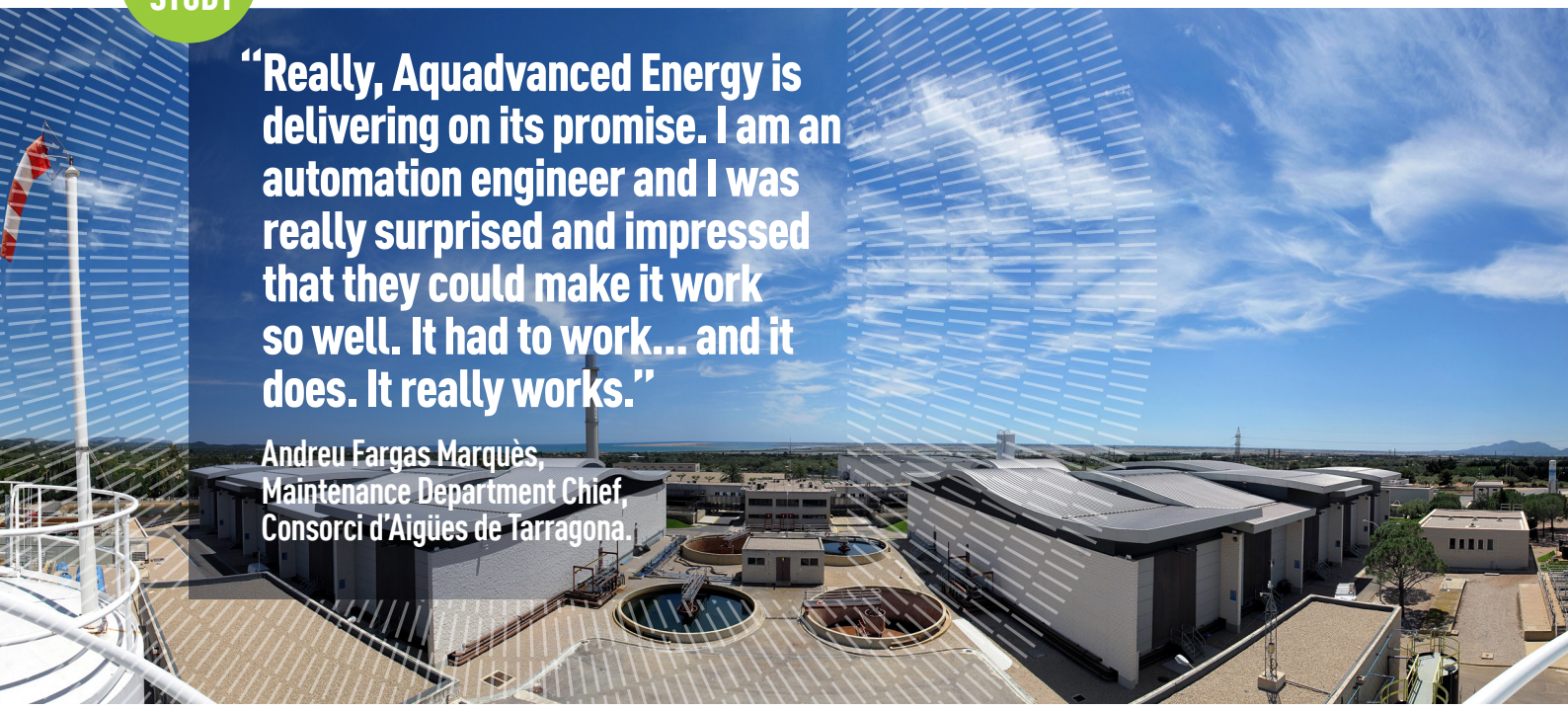
"Sure, the pilot results were encouraging, with an 18 percent reduction in electricity cost," says Fargas Marquès. "OK that's nice, but how do we roll that out across all the pumps across our whole network?"

At that point CAT's partner Adasa suggested the Suez Aquadvanced Energy software as a possible solution.

"When I looked at Aquadvanced Energy, I saw for the first time a product that could close the loop between lowest real-time electricity prices and optimised pump settings," Fargas Marquès recalls.

AQUADVANCED™ ENERGY

suez



> "Really, Aquadvanced Energy is delivering on its promise. I am an automation engineer and I was really surprised and impressed that they could make it work so well. It had to work... and it does. It really works."
>
> Andreu Fargas Marquès,
> Maintenance Department Chief,
> Consorci d'Aigües de Tarragona.

"Aquadvanced Energy was a working solution – rather than something that just created more work. We'd tried doing it manually using one of our engineers. It was way too time consuming. But it did enable us to understand and appreciate the automation concepts and algorithms that underpin the Aquadvanced Energy solution."

Seeing is believing

Seeing Aquadvanced Energy in action at Northumbrian Water Group – one of the UK's five largest water utilities – gave the CAT team further confidence. "We saw it working across a network much larger and more complex than ours. We figured that if it can work for them it could work for us," Fargas Marquès says.

The Northumbrian site visit also highlighted other important benefits Aquadvanced Energy could deliver – particularly with regard to automating critical operational decision making.

"CAT was formed 25 years ago, so a number of our key staff are heading for retirement," Fargas Marquès says. "With Aquadvanced Energy we could minimise our dependence on the knowledge locked up in the experience of a few key operational staff members and ensure consistent, high quality operational decisions even by relatively inexperienced operators."

Following a public tender process, implementation of the Aquadvanced Energy solution began in November 2013 and went live in November 2014.

However, a smooth implementation and go live was immediately followed by a worst case situation regarding real-time electricity prices.

"The first year of full operation was challenging," Fargas Marquès admits. "The wind failed to blow, real-time prices were higher than they've ever been. But despite that we finished the year with an eight percent energy saving over the previous year.

"This year – 2016 – wind generation levels are back to average and so far we're tracking to achieve at least 15 percent savings. I'm confident that as we continue to improve our optimisation algorithms, 20 or even 25 percent savings are achievable."

The business case proposition with the Aquadvanced Energy implementation was straightforward: to invest around one million euros to cut electricity costs by at least 15 percent per annum, giving a full return on investment well inside three years. After that, based on 2012 electricity prices, and average savings stabilising at around 20 percent, the net annual savings on 2012 usage figures is forecast to total around one million euros per annum providing a one year payback.

As a measure of confidence in its solution, Suez agreed to a retention of 250,000 euros withheld and only payable once at least 15 percent savings in any two years of the first three years post implementation were achieved.

The bottom line: mission achieved

The successful implementation of Aquadvanced Energy has made the seemingly impossible actually achievable – and, in effect, guaranteed by Suez.

"We are delighted with the decision to implement Aquadvanced Energy. It's solving a serious operational energy cost issue – which justifies the investment. And we're getting other valuable benefits in terms of water quality, lower overall greenhouse gas footprint, and supporting and training our network operators.

"The CAT consortium has a 75-year mandate. We're 25 years along the road. We expect to continue to enhance our Aquadvanced Energy solution as a strategic weapon in our efficiency toolkit for the next 50 years," Fargas Marquès concludes.