

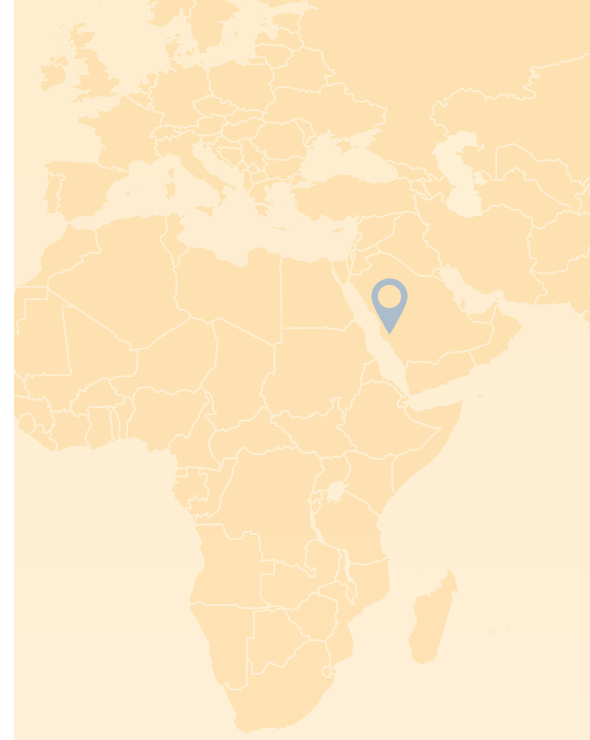
Case Study

THE CHALLENGE

Reducing Energy Consumption While Maintaining Reliability

Energy consumption has become an increasingly important consideration for water producers in the Kingdom of Saudi Arabia, spurring a shift away from energy-intensive thermal desalination and towards the more energy efficient process, seawater reverse osmosis (SWRO).

Approximately 60% of the country's water comes from desalination currently – which consumes roughly 20% of the country's energy usage – and demand is continuously rising. With the decoupling of power and desalination plants, it is now more necessary than ever to make desalination facilities energy efficient, and the government has directed water producers to decrease energy consumption as much as possible. As one of the biggest seawater reverse osmosis (SWRO) desalination facilities in the world, ACWA Power Rabigh 3 IWP was designed to address the growing demand for water while also keeping energy consumption low.



LOCATION

Rabigh, Saudi Arabia.

PROJECT

ACWA Power Rabigh 3 IWP

CAPACITY

600,000 m³/d

ENERGY SAVINGS

~500 GWh annually

CO₂ SAVINGS

~235,000 metric tons annually

THE INNOVATION SOLUTION**A Large-Scale Plant Aimed at Energy Efficiency**

In order to meet the rising demand for water, ACWA Power Rabigh 3 IWP was designed to produce a whopping 600,000 m³/day of freshwater. However, the end user Saudi Water Partnership Company had contract awards conditioned on achieving the lowest specific power consumption (SPC) level, so energy efficiency was also a significant concern for the facility's engineers, who looked for ways to reduce energy usage throughout the plant.

The engineers opted to employ Energy Recovery's PX[®] Pressure Exchanger[®] devices. This was the critical factor in reducing energy consumption, as the PX is able to recycle high-pressure energy from the reject brine and circulate it back into the system with a peak efficiency of 98%.

Reliability was also a key factor in the engineers' decision to employ the PX Q300; desalination facilities are critical infrastructure, especially one as large as ACWA Power Rabigh 3 IWP, which serves a water-stressed region. The PX fulfilled this requirement, requires no scheduled maintenance, and has a 25-year design life, maximizing the facility's uptime.

THE RESULT**An Energy-Efficient, Reliable Plant for a Water-Stressed Region**

By utilizing efficient solutions throughout the facility, the designers and engineers were able to reach their goal of reducing power consumption to under 3.2 kWh/m³. Energy Recovery's PX devices were a key component in achieving the stated goal and, on an annual basis, will save ACWA Power Rabigh 3 IWP approximately 500 GWh each year.

The energy efficiency is especially notable as it is one of the largest SWRO facilities in the world and serves a community that was previously reliant on a thermal desalination facility that used multi-stage flash distillation, a more energy intensive process than SWRO.

While many older multi-stage flash distillation (MSF) desalination facilities are still in operation in Saudi Arabia, water producers in the country are increasingly turning to seawater reverse osmosis (SWRO) systems when building new facilities or retrofitting existing ones. Because Saudi Arabia is the world's leading producer of desalinated water, the shift towards more energy efficient systems is significant.

- Saudi Arabia produced **11 million m³** of desalinated water each day
- This accounts for **10%** of the world's desalinated water production
- **55%** of the country's water comes from SWRO – **compared to just 10% in 1996**

