

ONE WATER APPROACH FOR SELF-SUFFICIENCY

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CUSTOMER

City of Santa Monica

LOCATION

Santa Monica, CA, USA

PROJECT TYPE

Municipal Potable Water Treatment

COMMISSIONED

2021 (pilot), 2023 (full-scale)

CAPACITY

41,500 m³/day (7,613 gpm / 10.9 mgd)

STATUS

Operational

OVERVIEW

California is among the highest-risk US states for droughts and water shortages due to climate change. Cities such as Santa Monica are turning to new technologies to increase water production and ensure a reliable supply for the future.

As part of its journey to become water self-sufficient by 2023, the Californian city of Santa Monica upgraded its Arcadia water treatment plant – the beating heart of its supply. The \$200 million investment program to achieve water self-sufficiency is part of a “one water” approach, which follows the strategy to help Californians see water recycling and renewing groundwater supplies as commonplace and a crucial part of the normal water supply.

A brackish water treatment desalination facility, Arcadia is the first major large-scale municipal installation of its kind in the US, serving as a model for increased water resilience for cities worldwide.

Incorporating ROTEC’s Flow Reversal Reverse Osmosis (FR-RO) innovation will help the City of Santa Monica on its ambitious journey to 99% water self-sufficiency – by increasing water production without increasing the plant’s footprint.



THE NEED

The City of Santa Monica wanted to increase supply from the Arcadia plant from 50 percent of the city’s water supply to 60-65 percent, by increasing the desalination plant’s recovery rate to 90%.

Engineering consultancy Brown & Caldwell chose ROTEC’S Flow Reversal technology as the most suitable for this flagship project, and collaborated with Walsh Construction to deliver the plant’s retrofit design and execution in a progressive design-build approach.

THE PROCESS

After a successful pilot commissioned in 2021, Arcadia moved to the next phase of retrofitting the entire desalination plant with ROTEC’s engineering package for a complete RO system design. To enable the plant to continue producing drinking water during construction, the retrofit of the plant’s existing four reverse osmosis trains, which treat 41,500 m³/day, was first completed.

The principle of FR-RO technology is based on periodically changing the flow direction of the saline stream in traditional RO pressure vessels. This prevents the scale buildup on the membranes that typically blocks traditional RO units from operating reliably at higher recovery rates. FR-RO can also reduce biofouling, a common problem in which bacteria accumulate inside the system and cause operational challenges. Intermittent reversal of the flow within the RO system prevents excessive concentrations from forming in any individual section of the system.

The patented approach involves dividing the system into individual blocks that can be switched to different RO stages and different flow directions. Each block can then operate as either the first or last stage of the system, allowing the pressure vessels to be used for most of the time as the first stage and only a small part of the time as the last stage, operating while reversing the flow. This enables Flow Reversal to be applied in industrial-scale plants with tapered flow arrangements.

Graeme Pearce, an expert in membranes and principal at Membrane Consultancy Associates, stated: “In the case study in Santa Monica, very high recoveries were achieved, which would be completely impractical and uneconomic for a standard design. This bodes well for this concept since the flow scale is large, so clearly, practical limitations have been overcome, and the cost addition has been paid for by the gain in efficiency.”

SUSTAINED HIGH RECOVERY FOR SELF-SUFFICIENCY

After the retrofit with ROTEC’s **FR-RO technology**, the facility recovery rate increased from 82% **to over 90%** with stable performance, greatly reducing the amount of water that goes to waste. For every 10 gallons of groundwater treated, 9 gallons of drinking water are produced, a significant improvement over the 8 gallons produced by the previous system. This is critical because groundwater is a limited resource, and any waste of that valuable water makes self-sufficiency more challenging.

The Arcadia desalination plant, based on the leading-edge Flow Reversal technology, allows higher generation of clean water, utilizing less raw water, and dramatically reducing brine volumes. Flow Reversal also minimizes OPEX, chemical use and clean-in-place (CIP) events, leading to a significantly more sustainable, affordable and eco-friendly water treatment approach.

The City of Santa Monica enjoys high-quality potable water, enhancing public health and sustainability, while providing self-sufficient water supply, overcoming water scarcity challenges.

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ROTEC provides holistic, modular reverse osmosis desalination solutions and services. With our eco-friendly approach based on our FR-RO technology, we enhance water recovery, efficiency, and reliability, supporting healthy communities.

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