Water Positive: Optimizing Membrane Performance to Restore More & Deplete Less

For over 30 years, AWC® has advanced membrane chemistry, cleaning protocols, and performance optimization technologies to help industrial and municipal water systems operate more efficiently and reliably. Through membrane autopsies and field investigations, we not only identified why reuse systems fail but also uncovered a larger opportunity for the market to accelerate the adoption, financing, and scaling of recovery-based water restoration to strengthen watershed resilience.

Today, over 200 million m^3/day of advanced water reuse capacity is installed globally, and a growing share of this capacity uses MF/UF and RO triple-barrier treatment trains for high-grade industrial and potable reuse. Yet recovery optimization has rarely been treated as a strategic lever, even though marginal recovery gains directly convert into new basin-available water volumes. Our work demonstrates that recovery optimization can act as a watershed restoration mechanism by transforming operational water losses into measurable restoration volumes.

The project aligns with SDGs 6.1.4 (change in water use efficiency over time), which formally recognizes the economic value of increased water productivity and expanded water supply. By structuring recovery gains as Volumetric Water Benefits (VWB), we enable previously undervalued water to become measurable, financeable, and territorially traceable water assets. These volumes can then support water stewardship investments by corporations pursuing Water Positive commitments, an approach increasingly aligned with Positive Water impact pathways recognized in global corporate stewardship frameworks.

Project Description

Our framework converts recovery inefficiencies into basin-scale restoration outcomes. When deployed at scale across reuse and brackish RO infrastructure, recovery improvements can generate tens of thousands of cubic meters per day of new basin-available water, strengthening climate resilience and reducing reliance on freshwater and aquifers. These restoration volumes can be structured as Volumetric Water Benefits and listed on a Water Benefit Marketplace, where corporations can invest in basin-specific replenishment volumes, typically financing both implementation and multi-year permanence cycles.

For utilities and industrial operators, the model delivers recovery upgrades and resilience improvements without the burden of tariff increases or unstable public funding cycles. For AWC, it elevates recovery optimization from an undercapitalized operational improvement to a bankable form of water restoration infrastructure.

Because Water Positive commitments are often associated with increased investment and operating costs, this initiative establishes agreements between multiple entities to offset consumption by investing in water infrastructure and the operation of treatment facilities, similar to the concept of the carbon offset model, addressing the core challenge of managing both CAPEX and OPEX.

Proof of Concept Results

Our submission is supported by two validated proof-of-concept applications demonstrating adaptability, scalability, and measurable watershed benefit, one “inside the fence” industrial reuse

system and one “outside the fence” municipal reuse initiative. More details on these projects can be found in the attached technical paper.

Industrial Power Plant Water Reclaim & Reuse System (Inside the Fence)

A Power Plant making a genuine effort to minimize water waste needed guidance to improve the efficiency of its processes to optimize those efforts. This example is referred to as “inside the fence” optimization because any improvements are within facilities owned or controlled by the corporation.

This facility routed multiple wastewater streams to lined outdoor ponds. During heavy summer rain events, pond overflow created compliance risk. The facility had been dosing ferric chloride and bleach to manage UF biofouling, but iron accumulation in ponds contributed to regulatory violations during overflow events, forcing the plant to discontinue coagulant dosing. This caused severe UF fouling, dramatically increased backwash frequency, and decreased recovery. Simultaneously, chlorination/dechlorination (with sodium bisulfite) led to severe RO fouling that became resistant to conventional CIP methods.

We implemented a recovery-focused optimization strategy that:

- Tripled the interval between backwashes and increased UF recovery from 60% to 92%, resulting in 70 million gallons per year of water savings now available for reuse.
- Eliminated the dechlorination requirement and reduced chemical intensity.
- Restored performance even where aggressive high pH chemistries failed
- Reduced RO differential pressure dropped by 52% (48 psi to 23 psi), enabling stable operation
- Increased RO recovery from 60% to 70%, resulting in an additional 22 million gallons per year in water savings.
- Reduced UF CIPs and post-clean flush water demand, adding 2.5 to 5 million gallons per year in savings.

This project reduced the plant’s water footprint while addressing watershed exposure by eliminating iron-laden overflow concerns and reducing chemical discharge risk, strengthening compliance performance under climate-stressed storm conditions.

Municipal Water Reuse Demonstration Facility (Outside the Fence)

A municipal water reuse facility in the planning stages is operating a demonstration pilot to prove feasibility. This case explores a hypothetical to explain how Volumetric Water Benefits (VWBs) are calculated and how they can be sold to manufacturers who wish to achieve water positivity. The trading of VWBs would be considered “outside the fence” as it impacts facilities that are neither owned nor controlled by the corporation. This facility operates at 1 MGD, with a planned full-scale design of 150 MGD. The demo targeted an 85% recovery but could not surpass 80% due to rapid fouling, when we were approached to help.

Through our tailored cleaning and antiscalant program, the facility achieved and sustained **85% recovery,** which it has maintained for more than one year. At full scale, the recovery increases from 80% to 85% delivering **11 MGD of feedwater savings** while reducing concentrate discharge volumes by approximately **29%**, a meaningful basin-scale benefit in water-stressed regions.

Innovation & Climate Resilience Impact

Our innovation achieves watershed-scale relevance through a replication-ready model that:

- Creates new basin-available freshwater without additional abstraction
- Restores watershed water balances through recovery-based regeneration
- Reduces concentrate discharge and associated environmental burdens
- Improves utility governance through verification, traceability, and structured accounting
- Enables scalable, private financing for watershed regeneration without tariff increases
- It is fully transferable across reuse and brackish RO infrastructure globally

This initiative positions membrane performance optimization as a watershed-restoration mechanism, not merely an internal efficiency measure. It shifts water investment logic from operational cost to the creation of measurable, financeable, and traceable restoration volumes under water stewardship frameworks aligned with the Water Positive objective.