EUROPEAN GREEN DIGITAL COALITION

Supported by the European Commission and Parliament at the EU Council's request, the EGDC unites companies to use digital solutions for reducing emissions across key sectors.

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This case study assesses an AI-powered digital optimisation tool used at SAWACO's CFRO + BWRO seawater desalination unit in Jeddah, Saudi Arabia. The solution analyses operational data and recommends new setpoints (e.g., pump pressure, brine flow, recirculation rates) to reduce electricity consumption while maintaining stable plant performance. In the reference scenario, the plant is operated using manual monitoring, operator experience and fixed operational settings. While functional, this limits energy efficiency and can increase operating costs and the carbon footprint.

This case study is an ex-post assessment for the year 2024. Baseline and solution electricity consumption are annualised using measured plant data (data period start: 01-Jan-2024; data period end: 20-Nov-2024), with results expressed per cubic metre of potable water produced.

Organisational contribution: SAWACO partnered with a technology provider to co-design, validate, and deploy the AI Digital Platform for SWRO optimisation at SAWACO's CFRO + BWRO desalination unit in Jeddah. SAWACO contributed the operational context and plant data required to develop and train the model, facilitated integration with the existing SCADA environment, and supported commissioning by testing and adopting the AI recommended operating setpoints within day to-day operations. This aligns with A-level classification as defined by ITU-T L.1480 (contribution of implementing the integrated solution or the innovation of the solution).

Quantified impacts:

2024	-141.6 to -175.4 tCO_2e/year	-0.26 $kgCO_2e/m^3$/year
Assessment period	*Net carbon impact range accounting for uncertainty*	*Net impact per m^3 of potable water*

Other identified impacts: **Further environmental impact:** **Energy savings -** Reduced electricity consumption at the desalination unit directly lowers operational energy demand (kWh) and, for a given grid emission factor, reduces associated indirect (Scope 2) GHG emissions from electricity generation. Operationally, improved control of key setpoints can increase process efficiency by maintaining closer-to-optimal pressures, flows, and recovery conditions, reducing unnecessary pumping and smoothing performance variability. More stable operation may also reduce mechanical and hydraulic stress on equipment (e.g., high-pressure pumps, energy recovery devices, and membranes) by avoiding inefficient or off-design conditions, which could in turn contribute to improved reliability and potentially longer component lifetimes (e.g., reduced premature membrane fouling/damage and/or less frequent replacements), although these effects are not quantified in this case study. Reduced electricity use also leads to operating cost savings for the plant operator through lower purchased electricity.

Website | **Contact SAWACO**

Relevant links: Contact the EGDC | Methodology | Calculator