

Reducing Environmental Impact and Enabling Higher Recovery of Nickel and Cobalt

alkaLi's new solution, in partnership with a global mining company, is enabling sustainable nickel and cobalt production for reduced environmental footprint and increased recovery. EC² technology integrates into the client's process, enabling up to 10x concentration as part of a multi-phase project with the client. This approach enables concentration of TDS to near saturation limits, as well as reuse of the treated wastewater.

The Challenge

A global mining company in Western Australia faced high costs to evaporate nickel- and cobalt-laden wastewater for salt concentration. The client needed a cost-effective solution that also minimized wastewater generation and aligned with their sustainability goals to maximize reuse. The saturation limit for seawater is 260,000 mg/l of sodium chloride, which would limit most membrane-based concentration solutions, and would also introduce much higher potential for scaling due to the presence of high-scaling ions in the feedwater.

The Solution

alkaLi engineers developed a two-phased approach to achieve 10X concentration of dissolved solids in the nickel effluent stream. For Phase 1, the team deployed a combination of its proprietary EC² technology stack including Selective Contaminant Extraction (SCE) and RO Infinity with CFRO to concentrate the solution, as well as CURE Antiscalant Chemistry to prevent scaling and reduce OPEX costs. Once integrated into the flowsheet, the system would substantially reduce the load on, or eliminate the need for the existing evaporator system, by concentrating the effluent up to 6X. Phase 2 will deliver further enhancements in concentration to deliver the 10X goal achieved through extensive testing.

The Benefits

alkaLi's Concentrate solution enables significant energy savings by reducing demand on existing evaporators, targeting 50% savings in Phase 1 and approximately 67% in Phase 2. The solution also allows for the reuse of 80% of wastewater, equating to over 13,000 m³/day of reclaimed water. This approach could bring substantial CAPEX savings, reduced footprint, and lowered emissions by optimizing concentration with membranes instead of traditional evaporators, supporting further expansion on-site and across the client's global operations.

Fast Facts

Location:	Western Australia
End-User:	Global Mining Company
Solution:	Metals and Ammonium Sulfate Recovery
Industry:	Resource Recovery of Nickel and Cobalt
Feedwater Source:	Plant Effluent
Technology:	SCE, RO Infinity with CFRO
Commissioning Date:	November 2024
Delivery Model:	Design-Build (DB)

	Up to 6X Concentration Factor in Phase 1
	>50% Reduction in Energy in Phase 1
	100% of production water meets internal reuse standards

Pilot Results (All units in mg/l)

Parameters	Feed	Concentrate
TDS	50,000-100,000	300,000
Nickel	1,200-1,666	2,000-2,400
Sulphate	35,000-57,000	150,000-250,000
Cobalt	80-120	150-180
Ammonia	12,000-17,000	75,000-98,000