



Integrating Electro Mining with the Salgenx Electrolyzer Cell: A Closed Loop Path to Metal Recovery and Energy Storage

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<https://salgenx.com/electrowinning-precious-metals-refining-by-salgenx.html>

Explore how the SEM electro mining process can be integrated into the Salgenx saltwater electrolyzer to enable simultaneous metal extraction, energy storage, and closed loop chemical regeneration in a modular system.



This webpage QR code

PDF Version of the webpage (maximum 10 pages)

Electro Mining

Electro-mining, as described, is a closed-loop electrochemical process that uses electricity and a continuously regenerated electrolyte to dissolve metals from ore, waste, or recycled materials and then recover them directly as high-purity solids through electrowinning. The system operates as a continuous flow loop, where metals are leached into solution, plated onto cathodes, and the electrolyte is recycled without significant chemical consumption, enabling efficient, modular, and scalable operation. Compared to traditional mining and smelting, this approach eliminates high-temperature processes, reduces environmental impact, and allows recovery from low-grade ores and waste streams, while producing clean water and concentrated metal outputs, making it particularly attractive for electrified, decentralized, and sustainable resource extraction.



Integrating Electro Mining with the Salgenx Electrolyzer Cell

What if a single system could extract metals, store energy, and regenerate its own chemistry continuously This article outlines how electro mining can be embedded into the Salgenx platform to create a new class of electrified resource and energy infrastructure.

Overview

The convergence of electro mining and saltwater battery technology presents a compelling opportunity to unify resource extraction, energy storage, and chemical processing into a single modular platform. By incorporating the SEM electro mining methodology into the Salgenx electrolyzer architecture, it becomes possible to transform a conventional energy storage system into a dual purpose electrochemical refinery capable of recovering metals while operating as a grid scale battery.

This approach aligns with a broader shift toward electricity driven industrial processes, replacing heat based and chemically intensive operations with closed loop electrochemical systems.

Core Concept: Dual Function Electrolyzer

At its foundation, the Salgenx system already operates as a membrane-less electrochemical platform using saltwater and chlorine chemistry. By introducing electro mining functionality, the electrolyzer cell is expanded to perform:

- Electrochemical leaching of metals from feedstock
- Ionic transport and separation within the electrolyte
- Electrowinning of metals onto cathode surfaces
- Continuous regeneration of the electrolyte chemistry

This transforms the system from a battery into a continuous electrochemical processing reactor.

Process Integration

1. Feedstock Introduction

Metal-bearing material such as:

- Crushed ore
- Tailings
- Industrial waste
- E-waste

is introduced into the electrolyte loop, either directly or through a pre-processing slurry system.

2. Electrochemical Leaching within the Cell

The Salgenx electrolyzer generates reactive species such as chlorine and oxidizing agents at the anode. These species act as in situ leaching agents, dissolving metals into ionic form without the need for external chemical inputs. Because the chemistry is generated electrically:

- Reagents are continuously replenished
- Chemical logistics are eliminated
- Reaction intensity can be controlled via current density

3. Ionic Transport and Separation

Dissolved metal ions circulate through the electrolyte, which in the Salgenx system is already engineered for high conductivity and flow dynamics. The oil and water phase separation used for chlorine handling can also assist in selective separation pathways for different species.

4. Electrowinning at the Cathode

Metal ions are reduced at the cathode and deposited as solid metal. Depending on the system configuration:

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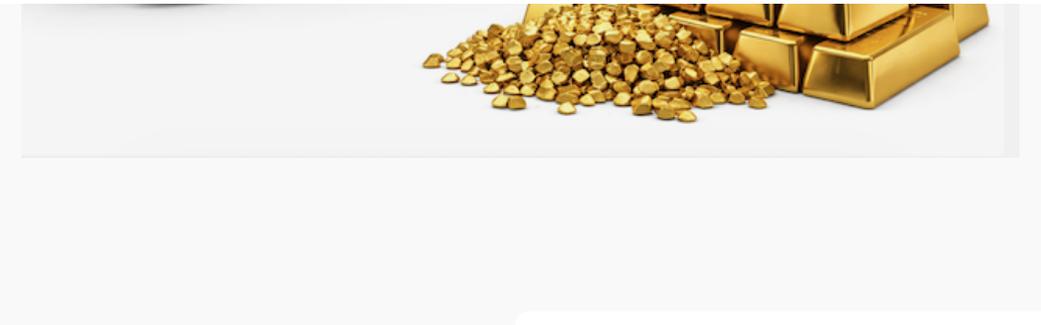
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Gold Ore Processing Potential

A 3,000 kWh Salgenx system has significant electrochemical capacity, theoretically capable of recovering large quantities of gold, but in practice the process is constrained by ore leaching rates, slurry handling, and reactor design rather than available energy. In a real-world electro-mining configuration, a single system operating over a 5-hour cycle could process on the order of hundreds to a few thousand tons of ore, yielding approximately 1 to 10 kilograms of gold depending on ore grade. This highlights a key strategic advantage: the system provides excess electrical capacity, enabling scalable, continuous metal recovery where throughput is driven by reactor engineering rather than power availability, making it well-suited for modular deployment in tailings reprocessing, low-grade ore recovery, and distributed mining operations.

1 KG of gold is currently \$146,000 (as of 26 March 2026).





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