Is lithium production in Chile sustainable?

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The role that batteries play in the fight against climate change puts Chile in front of a great challenge: how to obtain lithium without devastating the salt flats of Atacama, the driest desert in the world, where more than half of the reserves of the mineral essential for the manufacture of batteries for the consumer electronics and electric vehicles industries.

As more and more lithium-ion batteries are needed to power electric vehicles — a crucial step in the global decarbonization process — producers are focusing their efforts on the challenge of ensuring that the lithium production processes are as sustainable as possible, as production is scaled to meet this new demand. The growing importance of batteries has made lithium sustainability a key priority for these companies.

The production of Li_2CO_3 starts by pumping brine from the depths of the desert and deposited in large pools at a maximum rate of 1,600 liters per second where lithium chloride is concentrated from approximately 0.17% to 6% (expressed as Li metal). During the evaporation of the brines about 50 millions liters of water per year are lost into the atmosphere due to the action of the high solar radiation and heavy winds present causing the sequential fractional crystallization of NaCl, KCl, KCl-$MgCl_2$-$6H_2O$, LiCl-$MgCl_2$-$7H_2O$ and $MgCl_2$-$6H_2O$.

The conventional process of lithium extraction and concentration has a number of drawbacks both from a technical, environmental and operational point of view. The residence time of the brine necessary to reach a lithium concentration by weight of 6% in the evaporation ponds ranges between 12 and 18 months. This involves an extensive process, which in turn requires large areas of facilities for its operation. The overall process recovery efficiency for the process reported by SQM and Albermarle ranges around 43 and 49% respectively. The main losses are associated with unwanted precipitation of lithium or impregnation in other salts.

The presentation will describe alternatives to improve the sustainability of the lithium production in Chile.