

Warm In-situ Mining of Borate Solutes

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ABSTRACT: Research by IMC Chemicals Inc. (formerly North American Chemical Company) explored alternate methods to use heat from and improve brine quality for the process facilities. This led to a series of papers which detailed the modeling and implementation of a geologic heat sink. The primary benefit of this work was, however, to determine the energy balance (sinks and sources) for raising a porous block of earth in temperature from 21° C. to 35° C. These values are significant with respect to natural solubility of borax in natural brines.

Historical laboratory work by various companies and universities as far back as 1925 have shown that borax solubility increases with temperature. Resource models of Searles Lake indicated a significant source of borax available but the brines being extracted from the Lake were not of sufficient borax grade to be economically processed. Further laboratory work performed prior to and during the heat sink work indicated that an increase from 0.92% to 1.75% borate brine composition would be possible by heating the brines to 35°. The work was culminated with the installation of a system in 1995. This system began feeding a process facility in 1996. After start up, continuous improvements in operation have been implemented and the original goal attained, proving that heating in this manner is economically viable.

Thermoregulation requires a significant effort up front and during operation. Up front work is required to determine specific heat characteristics of the formation as well as modeling of circulatory effects resulting from the heating. Operational data is archived so that a regular energy balance can be calculated and system adjustments maintained. The scale of the system allows sufficient energy to be stored during the summer months to carry the heat losses that result during the winter.

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