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SULFATE INHIBITOR SELECTION AND USE

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Abstract

Calcium sulfate is the most common impurity in salt. It is found in many forms that must be removed at least in part during brine treating processes to control brine quality and maintain chlorine cell and evaporator equipment. Several types of sulfate inhibitors have been developed that lower the anhydrite form of calcium sulfate at its source. The newest all-organic product—with catalyst—is the most cost effective, having the potential to virtually eliminate calcium sulfate in some brines. Many applications average 75% inhibition rates at very economical dosages under 15 ppm. Sulfate inhibitors are now available for both chlor-alkali and evaporated salt production, meeting FDA/GRAS requirements for food salt.

Successful application of a sulfate inhibitor often begins with a preliminary laboratory report; justifying a more conclusive field evaluation based on cost performance data, potential savings, and brine quality improvements. The duration of a field test is determined by the residence times of individual brine wells and the desired reduction in calcium sulfate. Many solution mining evaluations begin to develop consistently lower sulfate values after just one residence-time displacement, while more definitive progress requires three to five displacements, or more. Evaluations should not be attempted in newly developing brine wells that carry-over undissolved salt—usually lower residence times. Laboratory methods are presented that were developed to utilize either rock salt or drilling core from the plant site, and actual dissolving water. Data is presented in graphic form to clearly show typical product comparisons and resulting cost performance.

Chemical handling is very important and must be considered when selecting a sulfate inhibitor treatment program. As an example, the newest organic inhibitors are viscous concentrations of acidic ingredients that must be handled and used with properly designed equipment. Chemical inhibitors are delivered in bulk via tank truck or ocean container, and in a variety of DOT approved containers and drums. International shipments are typically made in semi-bulk, one-way IBC containers of 1,041 liters (275 gallons) each.

In all cases, reliable chemical metering equipment must be chosen to handle and use the chemical under the most adverse of operating conditions. Particular attention should be paid to cold weather handling, possible contamination and environmental safety.

Sulfate inhibitor performance can be monitored with routine laboratory tests. Once established, daily control of chemical residuals is usually not necessary with the new organic inhibitors. However, it is still important to monitor distribution in multi-well water injection systems and limit wasteful or excessive use. A simple test procedure, adaptable to field office use and employing a unique PHTTT reagent, is presented that accurately measures the most cost effective all-organic inhibitors at very low (ppb) values in both water and brine.

Key words: Sulfate Inhibitors, Calcium Sulfate, Anhydrite, Sulfate Inhibitor Performance, Laboratory Test Method, Chemical Analysis Procedure, Cost Performance.