



Treatability of Perchlorate in Groundwater Using Ion Exchange Technology - Phase II (Awwa Research Foundation Reports)

Lee Aldridge, Thomas Gillogly, Geno Lehman

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Since 1997, several perchlorate treatment technologies have proven to be technically feasible at drinking-water treatment scale: biological reduction, ion exchange, reverse osmosis (RO) membranes, and granular activated carbon (GAC). The objectives of this project were to demonstrate the long-term performance of conventional ion-exchange technology for perchlorate removal and evaluate three disparate alternatives (chemical, biological, electrolytic) for brine treatment and reuse. This project evaluated three fundamentally different brine treatment and reuse processes. The first process, the biological brine treatment system, operated as a sequencing batch reactor (SBR). Spent 3 percent (0.5 N NaCl) brine was introduced to the nitrate and perchlorate degrading culture in the reactor and acetic acid was supplied to this culture as an electron donor for the reduction process. Once the nitrate and perchlorate were biodegraded, the mixture was settled, filtered, and amended with chloride before its reuse as regenerant solution. The second process, the physical/chemical brine treatment system, employed a high-pressure and high-temperature catalytic process to reduce the nitrate and perchlorate in the spent brine. After the process, the treated brine was ready for reuse without subsequent treatment. The system used a stoichiometric dose of a chemical reductant (ammonia) based on the measured concentrations of nitrate and perchlorate in the spent brine. The last process, a simple bipolar electrochemical cell, electrolytically reduced the perchlorate and/or nitrate present in the spent ion exchange brine. Once reduced, the brine could be immediately reused. This process did not require the addition of an electron donor as with the biological process, or a reductant as with the physical/chemical treatment process.

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