

Project Summary

Rocky Mountains Cooperative Ecosystem Studies Unit

Project Title: Concentrate Stream Modeling and Electromagnetic Effects on Crystallization
Type of Project : Research
Project Discipline : Natural
Funding Agency: Bureau of Reclamation
Other Partners/Cooperators: University of Colorado Boulder
Effective Dates: 3/30/2011 - 9/30/2013
Funding Amount: \$205,271 [FY12 \$93,176; FY11: \$112,095]
Investigators and Agency Representative: Agency Representative: Investigators: John Pellgrino, Department of Mechanical Engineering, University of Colorado, Boulder, CO (303)735-2631; john.pelligrino@colorado.edu
Project Abstract: The concentrate generated from membrane desalination contains the particulates and salts that were removed from the feed water. The volumes of these concentrate streams can be anywhere from 50% of the total feed for seawater desal and up to 15% of the total feed for brackish water desal. Concentrate disposal is even more difficult in inland areas where ocean discharge cannot be used. Minimization, disposal and management of concentrate streams are necessary to reduce waste disposal costs and increase water production efficiency. Reducing concentrate volumes from membrane processes require further concentrating sparingly soluble salts which often result in salt precipitation and scaling of the process equipment. Scaling in membrane processes requires expensive chemical cleaning, process downtime, and additional chemical cost. Water recovery can be increased without undesired scale formation, by controlling salt precipitation in concentrate streams. Currently no tool exists to comprehensively model concentrate streams and accurately predict their behavior as the concentrate streams are further dewatered and are reaching supersaturation points. Identification of such a tool can aid researchers in developing better unit operations to manage, reduce, and reuse concentrate streams. Recent research finding suggest that the use of electromagnetic fields on concentrate streams affect the rate of crystallization of sparingly soluble salts. Research is needed to understand how and why magnetic fields affect concentrate streams so that they can most appropriately used to control the kinetics of crystallization in membrane processes to further increase membrane product water recovery. This research will provide valuable insight into the kinetics of crystallization in reverse osmosis concentrate streams and investigate technologies and methodologies that can be used to increase water recovery in membrane processes.
Outcomes with completion dates: September 30, 2013
Keywords: desalination, electromagnetic field, crystallization; Bureau of Reclamation; University of Colorado Boulder