Desalination and Water Purification Research Program 2021 Funding

Arizona

Carollo Engineers, Inc.: Pilot Study for Biological Selenium Removal from Agricultural Drainage Water

Reclamation Funding: $403,002 **Total Project Cost: $806,004**

The proposed pilot study will demonstrate the feasibility and develop design and operating criteria for a full-scale two stage, fixed-bed (FXB) biotreatment system for removing selenium. This pilot study will provide valuable scale-up information for using the two-stage FXB system for selenium removal in the presence of nitrate and will develop and design operating criteria for a full-scale system. Based on these criteria, a conceptual design will be developed for a full-scale facility.

California

Sephton Water Technology, Inc.: High performance multi-effect distillation

Reclamation Funding: $139,968 **Total Project Cost: $558,100**

This Project will test new high temperature scale resistant polymer composite evaporator tubes and pre-treatment of seawater feed to remove scale forming ions in order to enable operation of Multi-Effect Distillation (MED) at brine temperatures up to 200°C, well above traditional operating limits for MED systems. The existing distillation plant will be augmented with an Ultrafiltration and Nano-filtration system to pretreat the natural saline feed water to remove scale forming ions using a process previously developed at the test site.

Connecticut

Yale University: Novel Electrosorption Process for Selective Removal of Silica: Implications for High Recovery Brackish Water Desalination

Reclamation Funding: $250,000 **Total Project Cost: $351,143**

Dissolved silica is a highly problematic scalant in water treatment and industrial processes due to its tendency to form difficult to remove scale on membrane surfaces. The proposed work is the development of a silica-selective electrosorption technology to remove silica from saline waters, effectively mitigating silica scaling in subsequent membrane processes. This technology if successful could increase water recovery and reduce costs for membrane treatment facilities.

Massachusetts

Massachusetts Institute of Technology: Multi- market pilot of low-cost, time-variant electrodialysis reversal desalination systems with optimized brine management

Reclamation Funding: $799,989 **Total Project Cost: $1,010,843**

The goal of this project is to conduct the last-mile pilots necessary to translate low-cost, time-variant electrodialysis reversal (TEDR) brackish water desalination with optimized brine management from an academic prototype to a commercial product for rural and tribal communities. This proposal leverages a portfolio of MIT's Global Engineering and Research (GEAR) Lab innovations funded through DWPR grants, culminating in a 1 gallon per minute pilot-scale photovoltaic (PV)-powered TEDR system.

Gradiant Osmotics, LLC: Membrane Brine Concentration for Inland Applications

Reclamation Funding: $800,000 **Total Project Cost: $3,657,490**

The proposal is to conduct applied research on a novel membrane brine concentration/desalination method by building and operating a pilot system that utilizes the technology. Specifically, the proposed pilot test is designed to demonstrate the ability of a combination of nanofiltration, semi-batch reverse osmosis, softening and CFRO technology to treat municipal effluent at an overall recovery rate of 99.8%. The system will substantially eliminate chlorides from the treated effluent while minimizing the amount of residual brine requiring offsite disposal.

New Mexico

New Mexico Institute of Mining and Technology: Permanently Hydrophilic Membrane for Organic Matters Removal from Oilfield Produced Water

Reclamation Funding: $249,969 **Total Project Cost: $499,938**

The overall objective of this proposed project is to develop an innovative, permanently hydrophilic polyvinylidene fluoride (PVDF) hollow fiber (HF) membrane for cost-effective and energy-efficient removal of dissolved organic matters from produced water (PW). Through this work a novel membrane will be created which will be evaluated using actual PW resulting in membrane performance and characterization for this water source.

Ohio

University of Cincinnati: High temperature gradient ceramic membrane distillation for potential reuse of produced water

Reclamation Funding: $249,630 **Total Project Cost: $500,911**

Building on previous research in produced water treatment, environmental nanotechnology, environmental chemistry, and membrane science, it is envisioned an innovative engineered system, targeting over 99% removal of total dissolved solids (TDS) and volatile organic compounds (VOCs) at low energy demand for treatment of produced water. It is anticipated that the proposed engineered system has great potential for enhancement of membrane distillation (MD) performance and mitigation of membrane fouling and scaling.

Texas

John Allen Floyd: SolMem LLC proposes multi-effect nanophotonic enabled direct solar membrane distillation to provide high-efficiency low-cost desalination

Reclamation Funding: $241,506 **Total Project Cost: $732,058**

The proposed is a direct, concentrated sunlight driven multi-effect membrane distillation process for desalination of high salinity water. The research consists of developing a 3-D mathematical model to describe the complex, coupled heat and mass transfer in the membrane process which will be used to determine the impact of feed water quality on performance. An evaluation and optimization process will be conducted as well as a technoeconomic analysis to determine commercial feasibility.

University of Houston: Contorted Polyamide Membranes for High Performance Desalination

Reclamation Funding: $249,466 **Total Project Cost: $306,748**

The proposed research aims to overcome the permeability-selectivity tradeoff that limits the performance of conventional polymeric desalination membranes by developing contorted polyamide membranes with improved permselectivity. Successful completion of the project is expected to achieve control over free volume and enhanced permselectivity in polyamide desalination membranes by incorporating contorted monomers in a scalable fabrication process.

William Marsh Rice University: Stimuli responsive block copolymer brush grafted carbon nanotube coating for active mineral scaling control

Reclamation Funding: $250,000 **Total Project Cost: $473,865**

The team proposes to develop membrane coatings consisting of stimuli-responsive block copolymer brush (SRBCB)-nanomaterial complexes for active control of mineral scaling in membrane desalination systems using a periodic electrical signal. The proposed project will design and synthesize SRBCBs, evaluate the impact, and develop and optimize techniques to apply coatings of SRBCBs-nanomaterial complexes onto reverse osmosis and membrane distillation membranes.