Ohio Water Development Authority

Research and Development Grant Program

Drinking Water Projects

City of Cincinnati

Fate and Transport of Pathogens in Areas on Induced Surface-Water Infiltration (1998, Grant Award - $246,450)

Over 1.5 million hydrologic and water quality data points were collected during the study. City of Cincinnati and USGS will provide this data to USEPA for possible use in the proposed Long Term (2) Enhanced Surface Water Treatment Rule. The data will benefit the entire water industry by providing treatment credit for riverbank filtration under the proposed new rule. This project has been one of the largest riverbank filtration studies in the United States.

City of Delphos

Nanofiltration Pilot Testing (1994, Grant Award - $17,500)

The goal of this study was to assess the viability of nano-filtration to treat groundwater under the influence of surface water, and, to further review its viability as a softening system. The City of Delphos water supply is derived from groundwater wells. The water quality is highly mineralized with high levels of hardness, sulfates, TDS and conductivity.

Due to a variety of factors, the viability of the system to treat groundwater under the influence of surface water was inconclusive. The use of the system as a softening alternative was further verified as a result of this study.

Final Report

City of Delphos

Construction of a Demonstration Nanofiltration Water Treatment Plant (1996, Grant Award - $100,000)

The goal of this study was to demonstrate the full scale applicability of nano membrane filtration. The system was designed to treat mineralized groundwater at a capacity of 100,000 gallons per day. Electrical demand, chemical usage, prefilter replacement, labor requirements, and maintenance needs were established.

Based on the final report, nanofiltration can effectively remove and reduce total dissolved solids, hardness, and sulfates. Pretreatment is critical to provide reasonable service life for the membranes. The type of pretreatment utilized should be pilot tested on a case by case basis.

According to the final report, this demonstration study could be utilized by other ground water systems in Ohio that have hydrogen sulfide, elemental sulfur, sulfates, or high total dissolved solids in their water.

Final Report – Executive Summary

City of Kent

Feasibility of Using Water Treatment Waste Lime Sludge as a Chemical Additive at the WWTP (1991, Grant Award - $150,000)

The goal of this study was to demonstrate the use of water treatment plant sludge to control alkalinity deficiencies in wastewater treatment plant operations. The secondary goal of the project is to analyze alternative methods of water treatment plant lime sludge disposal. The project was completed in two phases. Phase I analyzed feasibility and Phase II constructed a pilot demonstration system.

Based upon bench scale pilot studies and current and future mass balance equations, it was determined that the waste lime sludge can supplement approximately 75% of the wastewater treatment plant's alkalinity requirements when discharged at the head of the plant. Waste lime sludge must be transported via truck to the wastewater treatment plant due to the insufficient velocities in the sewer system.

Several waste lime sludge disposal options were evaluated. These options include: continue to lagoon and land apply the waste lime sludge, mechanically dewater and land apply the waste lime sludge, mechanically dewater and bag the waste lime sludge for retail sale or truck the waste lime sludge to the wastewater treatment plant.

Final Report – Part 1
Final Report – Part 2

The Ohio State University

Analysis and demonstration of enhanced coagulation for the removal of disinfection by-products (DBP) precursors in the State of Ohio (1997, Grant Award - $122,810)

The goal of this study was to investigate the mechanisms controlling the removal of dissolved organic carbon during the enhanced coagulation process. The information will be used to develop and evaluate a number of different strategies for increasing the effectiveness of the enhanced coagulation process, in both bench-scale and full-scale experiments.

The practical focus of the work was to minimize coagulant dosages required to meet enhanced coagulation requirements, in order to reduce operational expenditures and minimize the production of waste sludge at drinking water facilities.

Final Report

The Ohio State University

Ultrasonic Cleaning of Fouled Membranes during Drinking Water Treatment: Application to Small Treatment Systems (1999, Grant Award - $210,922)

This project investigated a new approach for reducing membrane fouling during drinking water treatment. The project examined whether ultrasound could be used to reduce membrane fouling by removing deposited layers of particles and/or keeping particles from depositing in the first place.

Application of this research will lead to many practical benefits to small treatment systems in the state of Ohio. Benefits include less costly treatment, elimination of chemicals, and increased reliability. Application of this research should also lead to a decrease in the negative health effects with both microbial pathogens and disinfection by-products from the presence of organic matter.

Final Report

The Ohio State University

Support Funding for the Ohio Water Resources Center (2000, Grant Award - $250,000)

The Water Resources Center (WRC) at The Ohio State University is the state- and federally-designated Water Resources Research Institute (WRRI) for Ohio. There are 54 Institutes nationwide; one in each state, plus Puerto Rico, the U.S. Virgin Islands, Guam and the Federated States of Micronesia, and District of Columbia. The WRRI program was originally authorized under Section 104 of the Water Resources Research Act of 1964; the Ohio WRC, established in 1965, was one of the first such centers approved at the national level.

The Water Resources Center serves the entire state of Ohio through research projects and outreach activities. Over the last five years, the WRC has been able to support research projects at seven universities in the state, in addition to OSU. Projects have been supported at Akron University, Case Western Reserve University, University of Cincinnati, University of Dayton, Miami University, Ohio Northern University, Ohio University, and University of Toledo, in addition to The Ohio State University.

Contact the Ohio Water Resource Center at The Ohio State University for specific research results

The Ohio State University

Removal of Agricultural Pollutants from Drinking Water by Membrane Processes (2001, Grant Award - $202,453)

This project will investigate the removal of nitrate and pesticides by using a variety of membrane systems. The experiment will be designed to evaluate process configuration, membrane and pollutant properties, and source water chemistry. The proposed research will provide important information about the effectiveness of membrane processes for removing agricultural pollutants common in source water in Ohio.

Final Report has not been completed

The Ohio State University

Ultrasonic Defouling of Membranes During Drinking Water Treatment: Phase I-Laboratory and Phase 2 - Pilot Scale Testing (2003, 2005, Grant Awards - $200,000, $167,174)

Although membranes are a $10 billion industry, the predominant impediment to their widespread use in drinking water treatment is membrane fouling. Current techniques for the reduction of fouling are not always practical because they require breaks in operation or use chemicals, and the effects are almost always temporary as degradation in filtration rates will occur upon re-starting of membrane operation. Previously, however, we have demonstrated in laboratory experiments that ultrasound dramatically reduced membrane fouling by colloidal particles by removing deposited layers of particles, thus greatly increasing the permeate flux of clean water.

To facilitative full-scale implementation of this technology for drinking water treatment, a number of research questions need to be addressed. In particular, the proposal will (1) demonstrate the effectiveness of ultrasonic assisted membrane filtration on NOM fouling, (2) develop a pilot scale unit to validate its effectiveness on a larger scale, and (3) modify a poly-vinylidene) fluoride membrane into a transducer material and evaluate the membrane/transducer system performance.

Application of the results generated from this research will lead to: (1) a more reliable and less costly treatment approach, (2) the potential elimination of chemicals from membrane filtration systems, and (3) a decrease in the health effects associated with microbial pathogens as well as disinfection by-products.

The final report has not been completed

The Ohio State University

Recovery of Metals from Concentrated Membrane Reject by Electrolysis (2005, Grant Award - $136,320)

The goal of this study is to evaluate the recovery of dissolved metals from membrane reject using electrolysis. Electrolysis is a process which uses electrical energy to drive chemical changes in an electrolyte. Although not tested for membrane reject water, considerable research has established that electrolysis can be used to recover metals from wastewaters.

The project will evaluate the impact of system and process parameters on metal recovery as well as the likelihood that the electrolyzed effluent will improve disposal scenarios. If successful, this technique could enable WTPs to recover and sell pure metals while safely disposing membrane reject.

The final report has not been completed

Village of Wellington

Purchase and Install a Culligan Water Treatment System to treat a portion of the Potable Water Needs for the Village of Wellington (1990, Grant Award - $78,706)

The goal of this study was to determine if a relatively inexpensive packaged water treatment plant system can adequately provide acceptable potable water under real life conditions in a municipal water system. Ohio EPA performance goals for a Culligan Multi-Tech drinking water treatment system were consistently achieved. Particulate removal was achieved with increases coagulant dosage. Settled water turbidity met the goal of 5.0 NTU max and averaged less than 2.0 NTU. Treatment cost of the package unit ranges from 48% to 89% that of conventional treatment.

Final Report

City of Westerville

Integrated use of Available Water Resources to Manage Disinfection By-Product Formation in Drinking Water (2001, Grant Award - $107,690)

The goal of this study was to determine if the supplemental use of ground water is used with surface water will decrease disinfection by-products. It is estimated that by replacing 10 to 25% of the surface water with ground water, the water systems will be able to comply with the lower disinfection by-products regulations.

Meaningful reductions in DBP's were demonstrated at the Westerville Water Plant be blending groundwater at 25 and 50% levels, with HAA's having the greatest reductions. Additional measures to optimize treatment and distribution may be necessary to ensure compliance with future regulations.

In addition to DBP reductions, the use of well water has benefited the plant by increasing the treat ability of the raw water during runoff events and very cold water.

Final Report