Agricultural Water Optimized Use, Recycle and Reuse Through Mobile Advanced Wastewater Treatment Technology

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Our water research reaches the world

- **Objectives**
- **Research Strategy**
- **Results to Date**
- **Future Studies**

Objectives

This project has both short term and long-term aspects as it focuses on the testing for agricultural application of three electrochemical water treatment technologies for recycle and reuse:

- **Electrocoagulation**
- **Electrodialysis**
- **Electrochemical Ozonation**
- **Field Analysis** New

Research Strategy

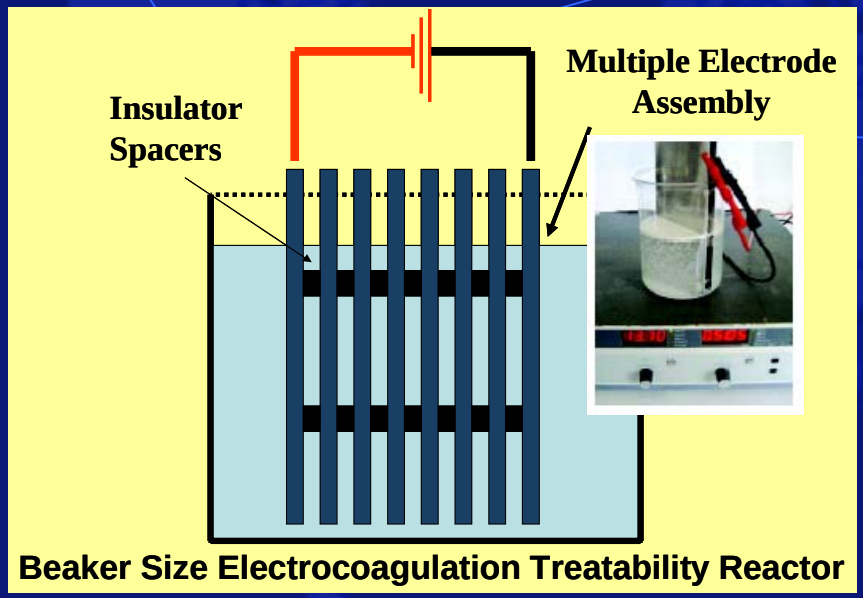
- Develop and optimize the treatment equipment
- Develop portable field deployable analytical methods 

- Optimize the above on Rio Grande Problems
- Begin field testing the systems

Develop and Optimize the Treatment Equipment

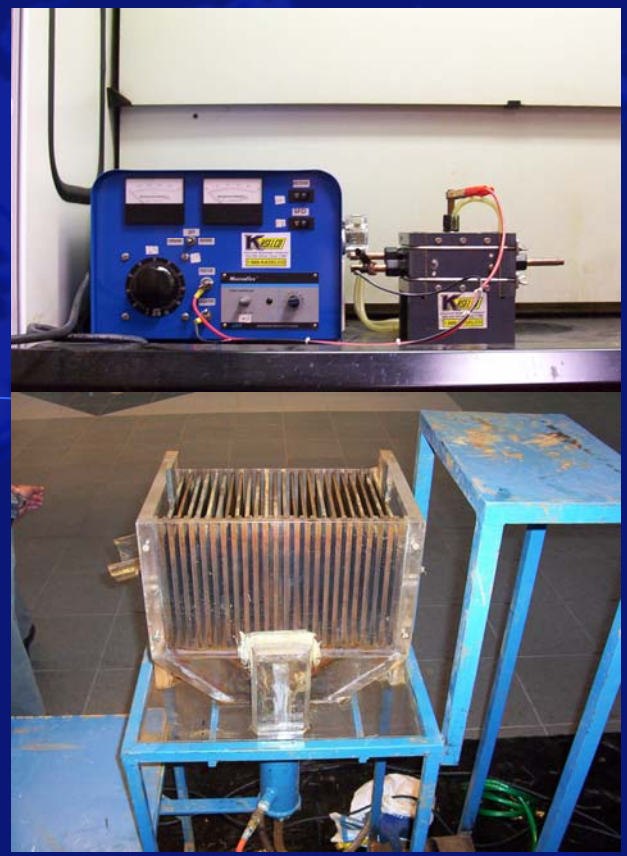
Screening Test

Field Deployable

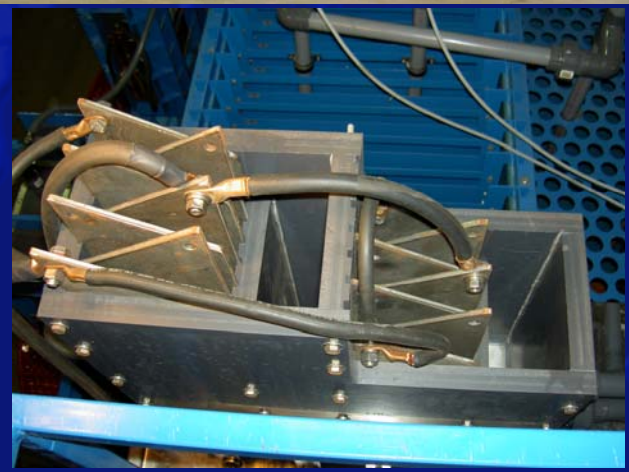


Beaker Size Electrocoagulation Treatability Reactor

Bench Scale



Mobile Field Deployable EC Plant

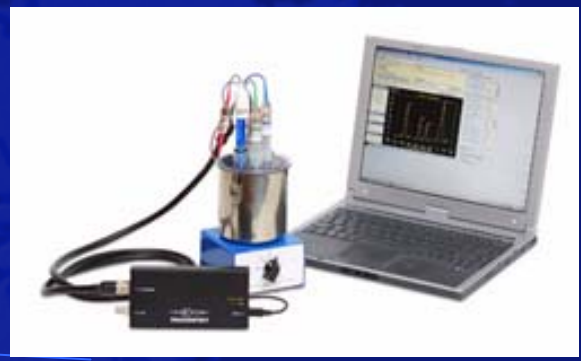


Sustainable Agricultural Water Conservation (SAWC) Research Project

LAMAR UNIVERSITY

Develop portable field deployable analytical methods

- **Anodic Stripping Voltammetry (ASV)**
- **Cathodic Stripping Voltammetry**
- **(CSV) Cyclic Voltammetry (CV)**
- **Amperometry (chrono-amperometric measurements)**



- Detects Cu, Zn, Cd, Pb, As, Hg, Tl, Bi, Ga, Ag, Cr, Mn, Ni to 1ppb in <2 minutes
- Sensitivity/accuracy equal to, or better than, ICP and AA

Predicts Treatabiity:
Metals
COD
Odor
Color

Experimental Results

Discovered that using both iron and aluminum electrode eliminates magnetite formation

Substantially increases both energy efficiency and pollutant removal efficiency

Publications in Progress

- Hector A. Moreno, Jewel A. G. Gomes, Paul Morkovsky, Cristrina Garcia, David L. Cocke, **Wastewaters, Electrocoagulation, and COD Removal**, **to be submitted to *Waste Management***
- Hector A. Moreno, Jewel A. G. Gomes, Paul Morkovsky, David L. Cocke, **Field Portable Electrocoagulation Reactor, to be submitted to *Waste Management***
- Hector A. Moreno, Jewel A. G. Gomes, Paul Morkovsky, David L. Cocke, **Field Portable Electrochemical System for Treatability Studies, to be submitted to *Water Environmental Research***
- Hector A. Moreno, Jewel A. G. Gomes, Paul Morkovsky, David L. Cocke, **Agricultural Water Treatment for Reuse by Electrocoagulation to be submitted to *Water Research***
- Jewel A.G. Gomes, Praveen Daida, Mehmet Kesmez, Michael Weir, Hector Moreno, David L. Cocke, **Use of Combination Electrodes of Aluminum and Iron for the Removal of Arsenic removal from Water Using Electrocoagulation, to be submitted to *Journal of Hazardous Materials***
- Jewel A.G. Gomes, Praveen Daida, Michael Weir, Hector Moreno, David L. Cocke, **Materials Characterization of After-Electrocoagulation Products using Combination Electrodes of Aluminum and Iron**, **to be submitted to *Science of the Total Environment***

Future Studies

- Begin work with Rod Reed SAS on meat processing water
- Explore the use of EC to better enable RO and ED on brackish water
- Field test the hand portable EC unit
- Develop the analytical methods for portable electrochemical analysis
- Start field work with mobile EC trailer

People Supported on the Project

Dr. David L. Cocke, PI
Dr. Jose Parga, Visiting Prof.
Dr. Andrew Gomes, Post Doc
Hector Moreno, ChE
Praveen Daida, ChE
Mehmet Kesmez, Chem
Michael Weir, Chem