

**Improving Water Quality by Developing, Implementing and
Field Testing Innovative Methods
FY 03 CWA 319(h)
TSSWCB Agreement No. 03-10**

Quarter no. 9 From 10/01/05 Through 12/31/05

I. Abstract

Finalizing the evaluation of the year one technologies and initiation of Memorandums of Agreement with the year two technologies were the main focus of the ninth quarter. Reports summarizing the evaluation of the year one technologies have been drafted. An article describing the effectiveness of the year one technologies was also developed for inclusion in the 2005 NPS Program Annual Report. Finally, the project received a one-year no-cost extension to provide the time necessary for successfully completing the project.

II. Overall Progress and Results by Task

TASK 1: Demonstration and Evaluation of New Technologies

Subtask 1.1: Identification of potential technology providers. TCE, TWRI, TFB, dairy industry representatives, EPA Region 6, TSSWCB, TCEQ, BRA, NRCS, and TAES will identify and select promising technologies represented by willing technology providers. (month 1 thru 3)

The following actions have been completed during this reporting period:

- a. Two technologies were evaluated for year one:
 - 1) "Electrocoagulation Technology" proposed by Ecoclean Industries, Inc. (Huntsville, TX)
 - 2) "Phosphorus Removal by Chemical Precipitation and Geotube[®] Dewatering" proposed by Miratech Division (Commerce, GA)
- b. Two technologies were selected to be evaluated in year two:
 - 1) "A Demonstration by Envirotech, Inc. of Phosphorus Removal From Liquid Manure Effluent at a Texas Dairy Farm by the Use of Bauxsol[™]" proposed by Envirotech, Inc. (Atlanta, GA)
 - 2) "Demonstrate and Evaluate the Use of Technologies to Reduce Animal Waste Pollution" proposed by EnviroLink (Greeley, KS)
- c. Once both year two technologies are evaluated, the RFP will be released for technology selection and implementation in year three.

66% Complete

Subtask 1.2: Identification of dairy cooperators in the North Bosque watershed area that use a flush system and lagoons to remove, store, treat, and land-apply effluent (manure and process-generated wastewater). TCE, TSSWCB and TFB will identify dairy operations willing to participate in these demonstrations. (month 1 thru 3)

The following actions have been completed during this reporting period:

- a. The year one technologies were implemented at the following dairies:
 - 1) "Ecoclean" – OSVE Dairy (proprietor – Mr. Bert Velson), Bosque Watershed.

- 2) "Geotube" – Triple X Dairy (proprietor – Mr. Wayne Moermen), Leon Watershed.
- b. The Brazos River Authority (BRA) is assisting the year two technology providers (Envirotech, Inc. and EnviroLink) with identifying a cooperating dairy for demonstrating their new technologies.

50% Complete

Subtask 1.3: On-site installation and start-up of the six pilot-scale technologies to be demonstrated. Technology providers will carry out the task of equipment transport, on-site installation, set-up, and start-up. With permission from the cooperating dairy owner/operator, the technology provider will prepare the site to install and operate the system for demonstration. (First installation by August 2003, last installation 6 months before the end of the 3-year project)

The following actions have been completed during this reporting period:

- a. TCE, TWRI, and BRA met with Envirotech on October 11, 2005 at 9:00 am at the Brazos River Authority, Waco to discuss initiation of a Memorandum of Agreement (MOA), the specifics of the proposed technology, and the timeline for the demonstration.
- b. TCE, TWRI, and BRA met with EnviroLink on October 20, 2005 at 9:00 am at the Brazos River Authority, Waco to discuss initiation of a Memorandum of Agreement (MOA), the specifics of the proposed technology, and the timeline for the demonstration
- c. MOA's between TAES and EnviroLink and Envirotech were finalized, signed by TAES on January 4, 2006, and sent to the technology providers. These MOA's are included in Appendix A.
- d. Once the MOA's are signed by EnviroLink and Envirotech and cooperating dairies are identified, then on-site installation and start-up of these technologies can begin.

40% Complete

Subtask 1.4: QAPP preparation and field data collection and analysis.

TCE will prepare the DQO and QAPP (August 2003 to August 2004)

100% Complete

TCE will collect samples from raw and treated effluent and resulting sludge. One of the evaluation tasks will be to analyze the sludge or by-product remaining after raw material treatment for P stability (August 2003 to May 2006)

The following actions have been completed during this reporting period:

- a. Project personnel conducted the final sampling trip for Geotube on October 3, 2005 to collect samples of the by-product remaining within the Geotubes. The samples were submitted to TIAER for analysis.
- b. Results of all sample analysis from both Geotube and Ecoloclean technology have been received from TIAER and the data analyzed.

33% Complete

Subtask 1.5: Develop reports and outreach education materials. TCE in cooperation with TWRI will produce educational brochures and publications on effectiveness of this innovative technology. Quarterly and final reports will be prepared and submitted in a timely manner.

The following actions have been completed during this reporting period:

- a. Reports summarizing both the Ecoloclean electrocoagulation technology and the Geotube technology have been drafted by TCE and are being reviewed internally by TWRI and TCE.
- b. A two-page article titled “Evaluating New Technologies For Reducing Nutrients In Dairy Effluent” was developed and submitted to the TSSWCB for inclusion in the 2005 Nonpoint Source Management Program Annual Report (See Appendix B)
- c. TWRI submitted the year 3, quarter 1 report to TSSWCB on January 13, 2006.

70% Complete

III. Related Issues/Current Problems and Favorable or Unusual Developments

- In the last quarterly report, it was reported that the final sampling of the Geotube technology and removal of the Geotubes from the cooperating dairy had been delayed as a result of communication difficulties with the technology provider, Miratech Division. In response to this, a certified letter was sent to Miratech Division. As a result, the final sampling was able to take place on October 3, 2005 and the Geotubes were readied for removal.
- TCE has not received economic data from Ecoloclean or Geotube therefore, economic analysis has not progressed. TCE is currently working to obtain the necessary information so that the analysis of the year one technologies can be completed.
- As reported in the last quarterly report, the project will not be completed by March 31, 2006 because the project was not initiated until December 2003. A one-year no-cost extension was requested and approved to provide adequate time for completing the project.

IV. Projected Work for Next Quarter

The following will be accomplished during the coming quarter:

- a. Finalize reports summarizing the results of the evaluation of the Geotube and Ecoloclean technologies.
- b. Draft Fact Sheets describing the results of the evaluation of the Geotube and Ecoloclean technologies.
- c. Initiate MOA's with Envirotech and EnviroLink.
- d. Identify dairy cooperators for Envirotech and EnviroLink.
- e. Begin installing year two technologies on cooperating dairies.
- f. Develop RFP for year three technologies.

Appendix A
Memorandums of Understanding

MEMORANDUM OF AGREEMENT

between

ENVIROTECH, INC

ATLANTA, GA

and

TEXAS AGRICULTURAL EXPERIMENT STATION

OF THE

TEXAS A&M UNIVERSITY SYSTEM

COLLEGE STATION, TX

Whereas Texas Agricultural Experiment Station (TAES) is testing new technologies designed for reducing phosphorus in dairy liquid manure effluent applied to the waste application field (WAF) without adversely impacting the onsite waste management system or other waste constituents,

Whereas proposals were requested by TAES from technology providers for technologies to be tested and demonstrated in the Bosque and Leon River Watersheds,

Whereas Envirotech, Inc submitted a proposal and was selected by the Technical Committee for evaluation in FY2006,

Now Therefore:

TAES AGREES:

- 1) To provide in-kind support of up to \$9,000 for analyses of raw, treated and recovered liquid manure effluent by the Texas Institute of Applied Environmental Research (TIAER) testing laboratory in Stephenville.
- 2) To collect samples of raw, treated and recovered liquid manure effluent on a weekly or on as needed basis after the system is optimized by the technology provider.
- 3) To assist technology provider with selection of a dairy cooperator.
- 4) To produce one report summarizing the information on effectiveness of this innovative technology in cooperation with TWRI.

ENVIROTECH, INC AGREES:

- 1) To make appropriate and mutually agreed upon arrangements with the dairy cooperator for on-site set-up and removal of their technology/system.
- 2) To provide written notice that the system has reached optimized effluent treatment stage prior to initiation of sampling by the Texas A&M University System (TAMUS) personnel. System must be optimized no later than May 1, 2006 to allow sufficient time for sampling by TAMUS.
- 3) To furnish all equipment, power, supplies (including chemicals), means of transportation and labor required at their cost to demonstrate their technology.
- 4) To operate and maintain the demonstration for a time period appropriate to scientifically prove the feasibility of the technology. No process/operation changes will be made after optimizing their technology/system.
- 5) To treat a quantity of lagoon / waste structure effluent comparable to the quantity used for normal irrigation rates on dairy.

- 6) To set-up the technology as proposed and approved by Technical Committee and maintain that set-up throughout monitoring period (unless modification is approved by the Technical Committee prior to implementation).
- 7) To set-up the technology to allow for the full development of mass balances of all analytes, solids, and liquids by:
 - a) Providing sampling ports to measure effects of all major components of selected technology and
 - b) Providing the means to measure the volumes or weights of all inflows (thru-puts), outflows, bi-products, and chemical or biological additives.
- 8) To provide all information necessary to conduct an economic analysis of the technology (i.e. equipment, chemicals, utility, and labor costs).
- 9) To provide a full written description of the cooperating dairy and its waste storage structure and waste handling system.
- 10) To avoid spills of manure/wastewater or chemicals before, during and after the demonstration of their technology.
- 11) To provide for the clean-up of and/or costs associated with the cleanup or damage caused by any manure/wastewater or chemical spills that occur as a direct consequence of the demonstration of their technology.
- 12) To not interfere with the daily operations of the dairy.
- 13) To not damage any equipment or infrastructure including (but not limited to) roads and berms of the waste storage and handling structure at the dairy farm. Any such damage will be repaired or damaged item(s) will be replaced at the technology provider's expense.
- 14) To remove all equipment and by-products from the cooperating dairy within 30 days of project completion.

That unless otherwise set forth by amendment to this agreement, any additional expenses incurred by the technology provider under this agreement will be the sole responsibility of that institution. TAES may terminate this agreement without cause by giving 30 days notice to Envirotech, Inc.

This Memorandum of Agreement is effective upon signature by all parties and will terminate on December 31, 2006. Continuation of demonstration and testing after the termination date will be subject to a written renewal of this agreement by both parties.

IN AFFIRMATION

DR. ELSA MURANO

DIRECTOR

TEXAS AGRICULTURAL EXPERIMENT STATION

DATE:

CHARLES R. LIVINGSTON

OWNER

ENVIROTECH, INC

DATE:

MEMORANDUM OF AGREEMENT

between

ENVIROLINK
GREELEY, KS

and

TEXAS AGRICULTURAL EXPERIMENT STATION

OF THE

TEXAS A&M UNIVERSITY SYSTEM

COLLEGE STATION, TX

Whereas Texas Agricultural Experiment Station (TAES) is testing new technologies designed for reducing phosphorus in dairy liquid manure effluent applied to the waste application field (WAF) without adversely impacting the onsite waste management system or other waste constituents,

Whereas proposals were requested by TAES from technology providers for technologies to be tested and demonstrated in the Bosque and Leon River Watersheds,

Whereas EnviroLink submitted a proposal and was selected by the Technical Committee for evaluation in FY2006,

Now Therefore:

TAES AGREES:

- 1) To provide in-kind support of up to \$9,000 for analyses of raw, treated and recovered liquid manure effluent by the Texas Institute of Applied Environmental Research (TIAER) testing laboratory in Stephenville.
- 2) To collect samples of raw, treated and recovered liquid manure effluent on a weekly or on as needed basis after the system is optimized by the technology provider.
- 3) To assist technology provider with selection of a dairy cooperator.
- 4) To produce one report summarizing the information on effectiveness of this innovative technology in cooperation with TWRI.

ENVIROLINK AGREES:

- 1) To make appropriate and mutually agreed upon arrangements with the dairy cooperator for on-site set-up and removal of their technology/system.
- 2) To provide written notice that the system has reached optimized effluent treatment stage prior to initiation of sampling by the Texas A&M University System (TAMUS) personnel. System must be optimized no later than May 1, 2006 to allow sufficient time for sampling by TAMUS.
- 3) To furnish all equipment, power, supplies (including chemicals), means of transportation and labor required at their cost to demonstrate their technology.
- 4) To operate and maintain the demonstration for no less than a 10-week time period after optimizing their system at the dairy farm. No process/operation changes will be made after optimizing their technology/system.
- 5) To maintain treatment at a continuous flow for the duration of the project.

- 6) To treat a quantity of lagoon / waste structure effluent comparable to the quantity used for normal irrigation rates on dairy.
- 7) To set-up the technology as proposed and approved by Technical Committee and maintain that set-up throughout monitoring period (unless modification is approved by the Technical Committee prior to implementation).
- 8) To set-up the technology to allow for the full development of mass balances of all analytes, solids, and liquids by:
 - a) Providing sampling ports to measure effects of all major components of selected technology and
 - b) Providing the means to measure the volumes or weights of all inflows (thru-puts), outflows, bi-products, and chemical or biological additives.
- 9) To provide all information necessary to conduct an economic analysis of the technology (i.e. equipment, chemicals, utility, and labor costs).
- 10) To provide a full written description of the cooperating dairy and its waste storage structure and waste handling system.
- 11) To avoid spills of manure/wastewater or chemicals before, during and after the demonstration of their technology.
- 12) To provide for the clean-up of and/or costs associated with the cleanup or damage caused by any manure/wastewater or chemical spills that occur as a direct consequence of the demonstration of their technology.
- 13) To not interfere with the daily operations of the dairy.
- 14) To not damage any equipment or infrastructure including (but not limited to) roads and berms of the waste storage and handling structure at the dairy farm. Any such damage will be repaired or damaged item(s) will be replaced at the technology provider's expense.
- 15) To remove all equipment and by-products from the cooperating dairy within 30 days of project completion.

That unless otherwise set forth by amendment to this agreement, any additional expenses incurred by the technology provider under this agreement will be the sole responsibility of that institution. TAES may terminate this agreement without cause by giving 30 days notice to EnviroLink.

This Memorandum of Agreement is effective upon signature by all parties and will terminate on December 31, 2006. Continuation of demonstration and testing after the termination date will be subject to a written renewal of this agreement by both parties.

IN AFFIRMATION

DR. ELSA MURANO

DIRECTOR

TEXAS AGRICULTURAL EXPERIMENT STATION

DATE:

PATTI MCGHEE

PRESIDENT

ENVIROLINK

DATE:

Appendix B
Evaluating New Technologies For Reducing Nutrients In Dairy Effluent

EVALUATING NEW TECHNOLOGIES FOR REDUCING NUTRIENTS IN DAIRY EFFLUENT

The Texas State Soil and Water Conservation Board, Texas Cooperative Extension, and Texas Water Resources Institute are collaborating to demonstrate and evaluate six new technologies aimed at reducing phosphorus from dairy lagoon effluent applied to waste application fields in the North Bosque and Leon River Watersheds. The two technologies evaluated in fiscal year 2005, **Electrocoagulation** and **Geotube™** de-watering system, both appear to reduce phosphorus levels in lagoon effluent.



Figure 1. Partially filled Geotubes™

The **Geotube™** de-watering system was demonstrated by Miratech Division on the Triple X Dairy in the Leon River watershed. **Geotube™** technology uses large porous tubes made from heavy-duty synthetic fabric.

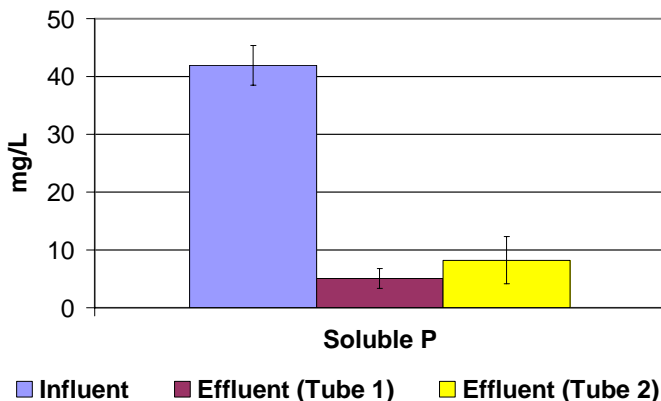


Figure 2. Soluble phosphorus reductions following Geotube™ treatment.

Lagoon effluent is pumped into the tubes after alum and a polymer are added to bind and precipitate phosphorus. As the liquid leaves the porous tubes and returned to the lagoon or used for irrigation, solids larger than the tube pore size are trapped. Once the tubes are full, the dried solids can be hauled off. Substantial reductions in total solids, volatile solids, and soluble phosphorus have been observed. Dairy producers are eager to learn more about the economics and performance of **Geotube™**.

Electrocoagulation (EC) technology was demonstrated by Ecoloclean Industries on the OSVE Dairy in the Bosque watershed. Lagoon effluent is pumped into a holding tank and processed to remove phosphorus with Aluminum and/or iron electrodes. Positively charged ions from these electrodes attract negatively charged phosphorus ions. The phosphorus bound to aluminum or iron is then removed by filtration and dissolved air floatation and skimming methods.



Preliminary results of the Ecoloclean system show significant reductions of soluble phosphorus were achieved. With the exception of week 2 when only a 75% reduction was observed, the Ecoloclean system reduced soluble phosphorus by over a 99%. A further assessment of this data and the economics will be completed by the end of the year.

Two technologies have been selected for evaluation during fiscal year 2006, EnviroLink's L4DB microbial technology and Envirotech's BauxsolTM technology. Two additional technologies will be selected for evaluation in fiscal year 2007. Texas Cooperative Extension will develop fact sheets on each technology for producers, regulators, and agricultural business-people to make their own decisions on the performance and cost effectiveness of each technology.