

Feasibility Study to Evaluate On-Site Treatment of Wastewater for Non-Potable Reuse (Reuse)

Jantrania, Gerlich, Bonaiti, and Wolfe

Summary:

This research effort addresses one of the four eligible projects listed in TCEQ Solicitation 582-19-9377, **RT-2.3.4**, questioning the need for modification of standard on-site wastewater treatment-train or maintenance requirements to improve quality and reliability of effluent for non-potable reuse purposes. The National Sanitation Foundation and American National Standards Institute (NSF/ANSI) Standard 350 are used for performance evaluation of on-site residential and commercial water reuse treatment technologies. However, most used aerobic treatment unit (ATU) in Texas is the NSF/ANSI Standard 40 units. NSF/ANSI Standard 350 effluent quality requirements are similar to those for toilet flushing reuse effluent quality specified in the TCEQ Chapter 210.82(8), but NSF/ANSI Standard 40 effluent quality requirements are not. BioMicrobics Model BioBarrier® MBR 0.5 and Clearstream® Model 500-DA on-site wastewater treatment technologies have been certified under NSF/ANSI Standards 350 as onsite wastewater reuse technologies. Both units will be used under “normal” and “abnormal” operating conditions in this project. Performance will be assessed by measuring *E. coli* and TSS concentrations in effluent to determine if the reuse water quality standards as specified in 30 TAC §210.82(8) are met under various operating conditions. Information on non-residential reuse facility operating in Harris County and at TXDOT rest area will be gathered, analyzed, and used along with the results from our experiment to determine the need for modification in technical or regulatory requirements.

Goals

1. To compare performance of two NSF/ANSI-350 approved technologies in a real-world operating condition against the effluent quality standards specified in 30 TAC §210.82(8);
2. To collect performance information on commercial reuse systems operating in Harris County and at TXDOT facilities;
3. To prepare a concise report specifying the need for modifications of standard on-site wastewater treatment-train or maintenance requirements to improve quality and reliability of effluent for non-potable reuse purposes.

Objectives:

1. Perform necessary changes to the BioBarrier® and Clearstream® on-site wastewater treatment technologies and get them ready for this experiment;
2. Finalize “normal” and “abnormal” operating conditions and operate the unit to collect data;
3. Conduct phone interview and site visits with Harris County and TXDOT to gather design and operational information on their non-potable reuse facilities;
4. Prepare data sets on effluent quality observed at the center and at other reuse facilities for analysis to determine answers to the research questions;
5. Prepare detailed and summary reports along with PowerPoint presentation for submittal.

Research Questions

Q1: Do NSF/ANSI-350 approved technologies with and without a membrane filter operating in a real-world condition meet the effluent quality requirements specified in 30 TAC §210.82(8)?

Q2: Is the experience with existing on-site reuse facilities operating in Harris County and at TXDOT rest-facilities satisfactory?

Q3: Are modifications needed to a standard on-site wastewater treatment train or maintenance requirements to improve quality and reliability of effluent for non-potable reuse?

Deliverables:

1. Experimental design specifying real world operating conditions for performance evaluation of the BioBarrier® MBR and Clearstream® units operating at the research center.
2. Justification for the experimental design conditions to simulate real-world operation.
3. Effluent quality data collected during the experimental evaluation of both the technologies;
4. Data and information gathered from Harris County and TXDOT facilities operating effluent reuse system for toilet flushing.
5. Quarterly progress and budgetary reports.
6. Final report describing all results and findings.

Final Experimental Design:

- Operate reuse system under “normal” conditions
 - Influent flow within $\pm 10\%$ 225 GPD, BOD/TSS 300 mg/L, blower operation according to manufacturer’s recommendations, alarm(s) attended within 24 hr.;
 - Effluent sampling and observation for 3 to 6 months;
- Operate reuse system under “abnormal” conditions
 - Influent flow variations as per Project 1, blower operation on/off during a week, alarm(s) ignored for >48 hr. to simulate system abuse;
 - Effluent sampling and observation for 3 to 6 months;

Influent flow variation from Project 1 (tentative)

Test Run	[gal/day]	[mg/L]	[lb/day]
TR1	225.0	300	0.56
TR2	180.0	375	0.56
TR6	157.5	900	1.18
TR7	180.0	1000	1.50

Neglected operation and monitoring conditions simulation during TR2, 6, and 7:

1. Blower turn off and remained off for three days or till odor is noticed;
2. Alarms ignored for more than two days or till effluent surfacing noticed;
3. System operation not monitored for three weeks.