Ohio Environmental Protection Agency

Division of Surface Water

Summary Report of Sample Results Obtained under the Household Sewage Treatment Systems General National Pollutant Discharge Elimination System Permit Program

(December 15, 2010-revised)

Introduction/Background

A wastewater discharge to waters of the state is required to obtain coverage under a discharge permit, or a National Pollutant Discharge Elimination System (NPDES) permit, unless exempt by law. Household Sewage Treatment Systems (HSTS) are not exempt and therefore required to discharge under the terms and conditions of an NPDES permit. On December 22, 2006, the Ohio Environmental Protection Agency (Ohio EPA) issued the General NPDES Permit Authorization to Discharge Wastewater from Selected New and Replacement HSTS (HSTS General Permit) No. OHK000001. The HSTS General Permit outlines eligibility for coverage under the permit, discharge design standards, operating requirements, sampling requirements and various records retention issues.

Also, in developing this HSTS General Permit, Ohio EPA worked with the Ohio Department of Health (ODH) and various local health districts to develop a concept of working through a partnership in determining eligibility and coverage under the permit. Ohio EPA developed a Memorandum of Understanding (MOU) outlining roles and responsibilities of Ohio EPA, ODH and the local health districts in implementing the HSTS General Permit program. If local health districts choose to enter into the MOU with Ohio EPA, they will be responsible for determining eligibility or individual residence coverage under the permit, facilitate operations and maintenance under the conditions of the permit and maintain records of sampling results required. In return, Ohio EPA would simple provide the necessary coverage under the permit based upon local health district recommendations and provide guidance and direction to the local health districts as requested. Approximately 80 local health districts chose to enter into an MOU and partner with Ohio EPA in implementing the program. As of the date of this report, Ohio EPA working with these local health districts has authorized over 3,500 individual residences to discharge under the HSTS General Permits.

A second HSTS General Permit No. OHL000001 was issued on June 23, 2008 and is virtually identical to HSTS Permit No. OHK000001 except for the provision related to the MOU. Under HSTS General Permit OHL000001, Ohio EPA would take on the responsibility of recommending coverage for all systems within the local health district jurisdiction because that local health district chose not to enter into an MOU with Ohio EPA. Approximately 500 systems have been authorized under the provisions of this HSTS General Permit.

A condition of being authorized to discharge under the terms of the HSTS General Permits is the requirement that any manufactured HSTS unit to be installed meet the design standards of the permits and be approved under the provisions of Ohio Revised Code (ORC) 3718.04 and Ohio Administrative Code (OAC) 3701-29. Under these provisions, any individually designed and manufactured HSTS unit must have received approval from ODH before it can be installed at any individual residence. The ODH Technical Advisory Committee (TAC) performs the function of reviewing applications for these individually manufactured HSTS units and making recommendations to ODH for approval for use in Ohio. In performing its review, the TAC evaluates design of systems and substantial sampling results indicating performance. Typically, these sample results reflect those associated with system testing protocols and do not include actual field operating conditions.

HSTS General Permit No. OHK00001 expires on December 31, 2011 and Ohio EPA has initiated the process of renewing that HSTS General Permit. As part of the process, on April 28, 2010, Ohio EPA decided to request field sampling data that should have been available at local health districts. The data would then provide a basis to evaluate how the various HSTS were performing in the field as well as a gauge as to how local health districts are managing their

programs in obtaining the information. Based upon the fact that over 3,500 discharging HSTS have been authorized over a three and a half year period and the permit requires annual sampling of the discharge, the estimates were that 5,000 to 6,000 sample results should have been available for this evaluation. Approximately 500 individual sample results were submitted to Ohio EPA as a result of the data request. Reasons for the lack of data included: (1) an unwillingness of local health districts to pursue submittal of data from homeowners, (2) a lack of homeowner or local health district knowledge of program, (3) no available labs in some areas to perform tests, (3) a "new" program or requirement to homeowners and a need to get up to speed, (4) labs being overwhelmed due to a sudden influx in analyses, etc. Though this outcome was disappointing and provides a minimal database to perform a true analysis/evaluation, Ohio EPA believes there is some value in the data and has chosen to proceed with the evaluation and use it as a tool to build on improvement of the overall HSTS General Permit program.

Analysis of Data Submitted

In performing its data analysis on the available field results, Ohio EPA has chosen to utilize the same statistical concept that the TAC would typically use or request in performing its application data review. In that review, the TAC would typically rely on a "confidence interval" analysis. Under such an analysis, the "estimated mean" (arithmetic average or geometric mean of available data), the standard deviation of the data, a value reflective of level of confidence desired and the number of data points available is utilized to calculate an upper and lower "confidence interval" or range in which the "true mean" may lie. The TAC would then compare the "confidence interval" of the available data (at a confidence level of 95%) to the design standards established in the HSTS General NPDES Permit. If the appropriate upper or lower "confidence interval" for the permit parameters fall below or above the design standards of the HSTS General Permit and there is an appropriate number of sample results available, the TAC would then consider recommending a system for approval.

The following table provides a summary of all the available data utilizing the above evaluation process. The column titled *Average/Mean of Data* represents the "estimated mean" while the column titled *Average/Mean Based on Confidence Interval Value* represents the "true mean" as described by the above analysis. As a comparison, the effluent limitations or design standards of the HSTS General Permit are included in the table.

Overall Data Evaluation

ALL	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value	HSTS General Permit Effluent Limitations
	TSS	491	35.6	41.6	18 mg/l
	CBOD5	495	20.9	25.6	15 mg/l
	Ammonia-N	502	8.8	10.3	2.0 mg/l (summer) 4.5 mg/l (winter)
	Dissolved Oxygen	471	6.7	6.5	$\geq$ 6.0 mg/l
	Fecal coliform (#/100ml)	465	56.0*	75.8*	2000 #/100 ml
	E. coli (#/100ml)	58	38.7*	108.1*	126 #/100 ml

*- Geometric Mean

Ohio EPA performed a similar analysis on each of the TAC recommended/ODH approved individual manufactured systems for which data was submitted. This statistical analysis was performed on each individual manufactured system regardless of the amount of data available. Again, as stressed earlier, the overall data set received through the Ohio EPA request is not sufficient to perform a true analysis and this is even more so with the individually manufactured systems. Attachment 1 does outline the evaluation for the individually manufactured units.

Comparison of Data Analysis to Recommended Action Levels

Since the inception of the HSTS General Permit program and even more so as a result of the Ohio EPA sampling data request, many local health districts have requested assistance on how to evaluate and interpret the sample results obtained on individual residence HSTSs when a permit limitation is exceeded. Ohio EPA's response to these local health districts has focused on the magnitude of the exceedance or violation. Since the HSTS General Permit only requires an annual grab sample, even though a permit effluent limit may be exceeded it may be within the variability of the test procedures or the general operations of the HSTS itself. To address this concept, Ohio EPA developed a document entitled *Discharging Household Sewage Treatment System NPDES Sampling Action Level Recommendations* in April 2010. This document is included as Attachment 2 to this summary report. The action level recommendations focus on two separate thresholds. The first threshold identifies activities that trigger an Action Level One response. In the range identified in the document, an effluent limitation for a given parameter is exceeded, however, the magnitude of such violation is not significant and it is anticipated that the HSTS is **operating as it is designed and intended**. The recommended response to the violation reflects this concept and actions taken by the local health districts would focus on insuring that appropriate and mandatory service is being provided. Under an Action Level Two scenario there is a more significant violation of the effluent limitation, the HSTS **may not** be operating as designed and intended and a more rigorous compliance position needs to be taken by the local health district. An HSTS that triggers an Action Level Two response needs to have service provided to bring the system back into operating standards. There is also an Action Level Three response highlighted under the plan. Discharges that fall in this category are those that are persistently exceeding limits by a significant margin and it then may be necessary to pursue maintenance and/or repairs to the system. This evaluation process has been accepted by the local health district community and is in wide spread use across the state.

Since this review or action level process has been presented for utilization across the state, Ohio EPA chose to do a cursory evaluation of the raw data submitted to consider what actions may be warranted. This evaluation indicates that approximately 35% of the systems sampled were meeting all limits established in the HSTS General Permit. On the other end of the spectrum, approximately 25% of the systems sampled would have triggered some kind of Action Level Two response. Overall, the results indicate that 75% of the systems installed for which sampling data was submitted are operating in the range indicating that the systems are operating as designed and intended.

Utilizing Data Analysis in Program Area

Though the data is not sufficient to thoroughly evaluate each individually manufactured HSTS, it does have value in providing a guide as to the overall effectiveness of the HSTS General Permit program.

As indicated by the data submitted and the results as presented, it should be stressed that the data analysis performed should primarily be used as a tool for overall program enhancement. Not only is there minimal available results to do a detailed statistical analysis, but also there is the potential that the results may be skewed for a number of reasons such as: (1) poor sample collection and/or analysis, (2) poor operations and maintenance of HSTS (e.g. such as turning off power to units), (3) lack of diligence taken by local health districts in completing database upon Ohio EPA request due to timelines established, (4) inherent variability in operations of systems, (5) fact that only a grab sample of effluent is collected at a given time in a year, etc. Several of these issues have been expressed as a concern of local health districts implementing the program. Therefore, the overall goal is and should be to have Ohio EPA, ODH, local health districts and manufacturers work to decide why the results obtained are not matching permit requirements and come up with the program initiatives to fix the problems. The data should not be used to decide on what systems should or should not be utilized in the state of Ohio. If an individual HSTS unit is on the TAC recommended/ODH approved list for use in Ohio, then it is permitted to be used in Ohio. Rather, the results of the analysis should be used to: (1) potentially improve design of HSTS, (2) modify HSTS General Permit when renewed to address sampling inefficiencies, (3) modify the MOU with local health districts to address compliance and sampling issues, (4) work with manufacturers to potentially develop an alternative sampling program, (5) create a uniform database to be utilized by local health districts in maintaining data and records, (6) potentially evaluate TAC review procedures to determine if modifications are necessary, and (7) provide a guide to ODH in rule development process currently taking place.

Conclusion

The HSTS General Permit program is in its early stages of implementation and the learning curve in establishing a sound and effective program has presented some challenges. Over time, the program will only improve by working in partnership with all parties involved: Ohio EPA, ODH, local health districts, HSTS manufacturers and the citizens of Ohio. The key of the program is to insure HSTS discharges, if necessary, do not impact water quality or human health. Through diligence, similar program analysis in the future and working in partnership with all parties this goal will be achieved.

Attachment 1:

Data Summary

for

Individually Manufactured HSTS

Consolidated Treatment Systems, Incorporated

Enviro-Guard ENV	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	17	33.1	55.9
	CBOD5	17	12.0	19.8
	Ammonia-N	17	2.15	3.52
	Dissolved Oxygen	16	7.5	6.7
	Fecal coliform (#/100ml)	17	61.1*	191.6*
	E. coli (#/100ml)	--	--	--

Enviro-Guard ENV-M	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	68	50.5	63.9
	CBOD5	68	20.7	30.3
	Ammonia-N	68	2.91	4.21
	Dissolved Oxygen	68	6.9	6.5
	Fecal coliform (#/100ml)	68	70.7*	148.9*
	E. coli (#/100ml)	--	--	--

Multi-Flo FTB	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	30	19.1	28.3
	CBOD5	30	3.2	4.9
	Ammonia-N	29	5.9	9.8
	Dissolved Oxygen	30	7.0	6.2
	Fecal coliform (#/100ml)	28	12.5*	40.0*
	E. coli (#/100ml)	--	--	--

Delta Environmental Products

DF Series ATU	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	11	27.5	41.4
	CBOD5	11	8.9	13.9
	Ammonia-N	11	5.6	10.6
	Dissolved Oxygen	11	8.0	6.3
	Fecal coliform (#/100ml)	11	31.9*	138.8*
	E. coli (#/100ml)	--	--	--

Ecological Tanks, Incorporated

Aqua Safe AS	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	97	22.8	31.4
	CBOD5	96	9.5	14.5
	Ammonia-N	103	4.0	5.8
	Dissolved Oxygen	104	7.3	6.9
	Fecal coliform (#/100ml)	102	46.5*	87.9*
	E. coli (#/100ml)	2	0	0

Hoot Aerobic Systems

Hoot H-NPDES Series	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	12	13.4	19.8
	CBOD5	12	4.4	6.6
	Ammonia-N	12	0.5	1.0
	Dissolved Oxygen	12	7.9	7.1
	Fecal coliform (#/100ml)	11	666.9*	1754.4*
	E. coli (#/100ml) %	0 (9)	-- (380.2*)	-- (3845.9*)

% - Systems installed not discharging to Lake Erie or designed to achieve E. coli standard.

HydroAction Industries

AP-Series	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	5	15.4	27.9
	CBOD5	5	14.3	23.8
	Ammonia-N	5	7.4	18.5
	Dissolved Oxygen	5	8.4	7.5
	Fecal coliform (#/100ml)	4	11.1*	72.7*
	E. coli (#/100ml)	1	0	0

Jet, Incorporated

1500 Series BAT (Internal Re-aeration)	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	49	10.4	15.8
	CBOD5	49	7.0	14.8
	Ammonia-N	48	1.2	2.1
	Dissolved Oxygen	49	6.3	5.9
	Fecal coliform (#/100ml)	48	28.1*	72.3*
	E. coli (#/100ml)	1	1100*	--

1500 Series BAT (Separate Re-aeration)	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	44	52.4	74.2
	CBOD5	44	20.7	29.4
	Ammonia-N	45	3.6	5.6
	Dissolved Oxygen	45	7.3	6.6
	Fecal coliform (#/100ml)	47	40.4*	96.4*
	E. coli (#/100ml)	--	--	--

NORWECO, Incorporated

Singulair Model TNT (Re-areation in Biokinetic)	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	34	37.6	77.5
	CBOD5	34	19.4	32.5
	Ammonia-N	34	12.1	18.9
	Dissolved Oxygen	33	4.7	4.0
	Fecal coliform (#/100ml)	35	106.8*	351.8*
	E. coli (#/100ml)	1	600*	--

Singulair Model TNT (Separate re-aeration)	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	68	49.5	63.0
	CBOD5	73	34.2	47.9
	Ammonia-N	75	24.8	29.8
	Dissolved Oxygen	54	6.1	4.8
	Fecal coliform (#/100ml)	51	297.5*	748.6*
	E. coli (#/100ml)	16	335.1*	2199.0*

ORENCO Systems, Incorporated

AdvanTex AX20	Parameter	Number Results	Average/Mean Of Data	Average/Mean Based on Confidence Interval Value
	TSS	8	8.6	15.7
	CBOD5	8	3.6	6.9
	Ammonia-N	8	0.85	1.8
	Dissolved Oxygen	8	5.8	4.4
	Fecal coliform (#/100ml)	8	3.2*	13.2*
	E. coli (#/100ml)	--	--	--

*- Geometric Mean

Attachment 2:
Action Level Response
to
HSTS General Permit
Effluent Limit Violations

Discharging Household Sewage Treatment System NPDES Sampling

Action Level Recommendations

Parameter	Action Level One	Action Level Two
CBOD5	15 < X < 40	X ≥ 40
TSS	18 < X < 45	X ≥ 45
Ammonia (S)	2.0 < X < 12.0	X ≥ 12.0
Ammonia (W)	4.5 < X < 12.0	X ≥ 12.0
Dissolved Oxygen	6.0 > X > 3.0	X ≤ 3.0
Chlorine	0.038 < X < 0.10	X ≥ 0.10
Fecal Coliform	2000 < X < 5000	X ≥ 5000
E. coli	126 < X < 1030	X ≥ 1030

Action Level One – Letter to homeowner acknowledging concern and requesting verification that service provided as per mandated service contracts. If no verification of service can be provided then service provider must be contacted for routine operation and maintenance as per service contract. Also, highlight responsibility of homeowner to operate and maintain system (a fact sheet will be developed to provide homeowners with do's and don'ts of system operations).

Action Level Two – Letter to homeowner acknowledging concern and fact that system is not "operating as designed and intended" and corrective action is necessary. Homeowner must contact service provider to provide service to system. Once service provided then homeowner must submit verification to LHD and LHD may require a resample of parameters resulting in Action Level Two review. The homeowner, service provider and local health district should work together to assess the system and try to determine other reasons for poor system performance including a more detailed assessment of potential or excessive system inputs, or substances (i.e. medications, cleaners) that may disrupt the system's performance. If parameters continue to be exceeded, then go to Action Level 3.

Action Level Three - If public health nuisance parameters (e.g. total suspended solids, $CBOD_5$, fecal coliform or *E. coli*) or ammonia-N routinely exceed Action Level Two thresholds, then an investigation by the local health district is recommended, and may include, but is not limited to, short term repeated system monitoring for parameters of concern (i.e. 5 samples over 2 weeks with a calculation of arithmetic and/or geometric mean as appropriate), and/or installation of tertiary treatment as necessary to abate the nuisance.