Commonwealth of Pennsylvania
Environmental Resources
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Subject: Advisory Notice
Research on Operation of
Pressure Distribution Systems with
Pump and Siphons

To: SEWAGE ENFORCEMENT OFFICERS
COUNTY HEALTH DEPARTMENTS

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Through: Chief, Division of Local Environmental Services JDB/RES

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Based on input from several Sewage Enforcement Officers and analysis of data collected through the Department's continuing evaluation of pressure distribution systems installed under the experimental program, it has been determined that a number of factors can affect the system's function. Although installation errors can be minimized by careful inspection of the completed system and the educating of contractors and applicant/permittees, certain installation techniques and the quality of the effluent in the dosing tank have the potential to create maintenance problems.

The following is a description of the conditions encountered, methods of correction, and recommendations to minimize any potential problems associated with pressurized distribution systems:

IMPROPER SYSTEM DRAINAGE BETWEEN DOSES DUE TO USE OF CHECK VALVES:

Three experimental systems have experienced partial hole clogging due to accumulation of sediment and growth of an aerobic slime within the lateral and manifold pipes. This condition appears to be caused by the presence of a check valve, which holds the effluent in the distribution system after each dose cycle, allowing the suspended solids in the effluent to settle to the bottom of the lateral pipes and a jelly-like, black material to develop.

Symptoms

1. Increased running time of the dosing pump;

2. Frequent pump starts;

3. Pump burnout due to continuous operation.

Corrective Action:

Remove the check valve and substitute a quick disconnect; or disable the check valve;

> Once this corrective action is taken, in order to put the system back in operation, operate the pump for two to three minute cycles, allowing the effluent in the pipes to drain back from the laterals between each cycle; repeat this procedure until the pump rate (gpm) approximates a minimum design rate of the system.

Modification of Future Designs:

Use of check valves should be avoided in system designs. A continuous minimum uphill grade on the delivery pipe must be maintained on pump systems.

EFFECTS OF POOR QUALITY EFFLUENT ON CERTAIN PUMP-SYSTEM DESIGNS:

Several systems were observed in which the delivery pipe from the pump tank failed to maintain a consistent uphill grade from the dosing tank to the system's manifold. In this instance, the effluent may be unable to drain toward the lateral system or back to the dosing tank.

Sympton:

The lack of proper drainage, in combination with a poor quality effluent, may result in sediment and foreign debris being trapped in the laterals promoting hole clogging.

Corrective Action:

The SEO through design review of the proposed system and final inspection must assure that the delivery pipe leading to the system manifold maintains a consistent, minimum uphill grade.

SIPHON PROBLEMS DUE TO POOR QUALITY EFFLUENT AND TANK SETTLING:

Extremely poor quality effluent in the dosing tank has been observed in several instances, which has resulted in partial clogging of the discharge holes. If partial clogging occurs, the siphon may cease to cycle and instead becomes an overflow type device where one gallon into the dosing tank results in one gallon exiting the dosing tank through the waterlogged siphon. Erratic siphon function may also result from excessive settling or shifting of the siphon tank.

Symptoms:

1. Poor quality effluent in the dosing tank (floating debris, large particles in the effluent).

2. The water level in the siphon tank covers approximately 75% of the bell at all times.; and,

3. Additional water added to the siphon tank is drained off gradually, not allowing the tank to fill to normal cycle depth.

4. The water level in the tank rises above normal high water level in the siphon tank without siphon action occurring.

5. Slow, continuous drainage from the siphon tank.

6. Obvious signs of shifting of the tank or settling, causing loss of level of both the siphon bell and trap.

Corrective Actions:

1. Determine if the siphon bell and dosing tank are level. If necessary, relevel the siphon bell or relevel the entire tank to establish proper siphon action.

2. Remove the lateral end caps and flush the system several times with fresh water. Replace the system end caps (installation of cleanout ports, a diagram of which is attached to this notice, may be substituted for the end caps where the effluent quality is extremely poor or foreign objects are found in the pipes, and repeated clogging is possible).

3. If the effluent quality is still poor, recommend to the applicant/permittee that the septic tank be pumped annually, and/or septic solids retaining devices; or where feasible, multiple septic tanks be installed.

Modification of Future Designs

The variability of effluent quality in the dosing tank from installation to installation will be difficult, if not impossible, to control. It is, therefore, more feasible to improve the ability of the lateral system to handle and discharge larger particles of sediment and continuously flush the lines during the siphon cycle. By using large diameter holes, the individual laterals will be capable of discharging poor quality effluent without experiencing clogging. Also, by increasing the rate of discharge from each hole, the velocity of the effluent moving through the delivery pipe, manifold, and laterals will serve to scour the pipes of any accumulated sediment and debris.

Siphon system design should be developed under the provisions of Section 73.44(c) (Individually Designed Pressurized Systems), or Section 73.72 (Alternate Sewage Systems), using the following design guidelines:

1. The diameter of the delivery and manifold pipes must equal or exceed the diameter of the siphon used.

2. Only the delivery pipe-to-manifold connection method shown on page IX-18 of the SEO Manual should be used with siphon systems. The designer and contractor must assure that the delivery pipe has no low spots and maintains a continuous downhill grade to avoid the formation of traps in the delivery line.

3. Hole diameters less than 5/16 inch should not be used.

4. The total discharge from all the holes in the absorption area should be within 20% of the average discharge rate of the siphon used.

5. The air purge line, located inside the dosing chamber, must have a diameter equal to the delivery pipe.

6. The elevation change between tank and manifold should be measured from the low water line, not the high water line.

7. Use of multiple compartment septic tanks, in combination with septic solids retaining devices, should be recommended to the applicant/permittee to maintain a high quality effluent in the siphon tank.

8. The dosing tank should be set on a firm foundation or concrete base to avoid settling which could affect the siphon's function.

A revised diagram of a typical siphon installation is attached to this notice, and should be inserted in your copy of the SEO Manual to replace the existing diagram on page IX-26.

SLIPPAGE OF FLOAT CONTROLS IN PUMP TANKS:

Float control devices attached to the vertical leg of the delivery pipe in the dosing tank have been observed to slip and alter the pump cycle, and in some cases deactivate the alarm. Where plastic straps are used, effluent which coats the delivery pipe can eventually cause the straps to slip. Where non-stainless steel clamps are used, the straps may corrode.

Corrective Action and Modification of Future Designs:

The most effective means of preventing slippage of the float devices is to place couplings (PVC or ABS) in the vertical pipe to correspond to the float level; the floats are then strapped to the pipe above the couplings using either plastic or stainless steel fittings which will not corrode. The presence of the coupling in the vertical pipe will not allow the float device to slip below that level.

If you have any questions, please contact your Regional Sewage Specialist Supervisor.

Attachment