Missouri
Department of
Natural Resources

Leachate Recirculation
September 2008

The trend in solid waste disposal seems to be toward wet landfills. More and more owner/operators desire to recirculate leachate, both as a means to manage leachate and as a way to stabilize the landfill more quickly. Also, we are involved in an increasing number of discussions regarding bioreactor landfills and many of the SWMP staff have attended training courses on the subject in the past two years or so.

The Missouri regulations simply require that leachate recirculation be performed using 'an approved engineering method.' With no specific requirements, it is difficult to determine the appropriate level of review necessary to approve system designs. We realize that leachate recirculation, as with many other aspects of landfill design and management, requires a certain amount of flexibility because of the non-homogeneity of the waste mass.

Recirculation system designs are based on, among other things, waste absorptive capacity and permeability, which are essentially best guesses. These assumed waste properties are the basis for determining acceptable leachate recirculation rates. Because of this, the SWMP may not perform a detailed review of these aspects of design, but we will rely on the design engineer to do so. This doesn't mean that the recirculation rate doesn't have to be determined, and that we won't look at the estimates. It simply means that as long as the estimate is reasonable we won't over-analyze the calculations. Ultimately, no matter what the estimate is, the end result is what matters.

We have begun to focus more on operation and record keeping as being the important issues. Most recirculation systems use the same basic concepts. We would like to know more about how they are actually operated. How does the system operator align the system to use one set of laterals vs. another? How does the system operator know when they have pumped enough into a particular set of lines? What are the parameters they monitor that tell them when to stop? How does the operator know when to stop using recirculation lines in a particular area and move to aother area? What are the indications they use to make that decision?

We also want to know what portions of the systems are installed, so we will require submittal of as-built drawings showing the piping layout. We also want to know where connection points and valves are located. This is not only because we need to know what landfill infrastructure is in place for permitting and recordkeeping requirements, but also in the event we would be required to take over a landfill in post-closure. While it is extremely unlikely the department would continue to operate a recirculation system during post-closure, we still need to know where everything is located in case we would ever have to excavate for any reason.

We would also like to see the effect recirculation is having on the overall leachate management practices at the landfill. This could be done by measuring sump pump cycle times (inflow rates), keeping track of the amount of leachate recirculated; where and when it is recirculated; total leachate in storage; precipitation, etc. We think leachate recirculation is more than just turning on the pump and running it until leachate breaks out on the sideslopes. It should be a systematic effort to raise the moisture content of the waste to field capacity.

Recirculation of leachate from one landfill into another, even if located on the same property, will not be allowed because it would make it more difficult for the owner/operator and the department to determine the source of contamination should groundwater problems develop at the site.

We will most likely no longer approve leachate recirculation from sumps. We do not believe this is a practical method because the automatic level control systems will pump a given volume for one pump cycle, which in most cases is probably not enough leachate volume to entirely fill the recirculation system and allow even distribution of leachate throughout the targeted waste mass. Repeated cycles may result in the waste mass beneath the heads of the lateral systems to be saturated, while waste mass beneath the ends of the lateral systems will be left dry. We have not yet decided how we will handle this issue, but we are thinking along these lines.

Spray application of leachate onto the working face of the landfill will not be allowed.

General Conditions

The following general conditions will apply to all leachate recirculation approvals:

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1. Approval of leachate recirculation in no way waives the requirement to maintain less than twelve (12) inches of leachate head on the composite liner system.

2. The operator must conduct daily inspections of the landfill to determine whether leachate outbreaks are occurring in the area of recirculation. If the system is not performing adequately, recirculation in that area must cease immediately and the owner/operator must contact the department as soon as possible. It is difficult to define adequate performance, but the system must be capable of recirculating leachate with no more resultant problems than a typical landfill that does not recirculate. Performance will be deemed unsatisfactory if the department observes any of the following:

   a. Recurrent leachate outbreaks at the same location.
   b. Numerous leachate outbreaks.
   c. Excessive odors that can be attributed to recirculation.
   d. Leachate outbreaks of sufficient magnitude to impede normal operation and maintenance of the landfill, create a potential to cross the property boundary, and/or enter waters of the state

3. The operator must keep detailed records containing, at a minimum, the following information for each sump area (the portion of the landfill liner that drains to a particular sump):

   a. Dates of recirculation and the beginning and ending time
   b. Rate of recirculation in gallons per minute
   c. Daily/weekly volume of leachate generated
   d. Daily/weekly quantity recirculated
   e. Source of leachate (ponds, tanks, sumps, etc.)
   f. Method of recirculation (force main, pumping from trucks, etc.)
   g. System adjustments
   h. Weather conditions, including rainfall amounts
   i. Notation of any leachate outbreaks and corrective measures taken

4. Recirculation will not be allowed to continue in any area of the landfill that has reached field capacity, as indicated by short circuiting of the recirculated leachate directly back to the collection sump(s).

5. Within sixty (60) days of installation of any portion of the leachate recirculation system you must submit as-built drawings showing the locations, depths, and types of materials for all system components.

Requirements for Engineering Submittals

1. A narrative discussing the indicators that will be used by the operator(s) to determine when recirculation in a particular area of the landfill should be ceased.

2. A demonstration using the HELP Model or other approved method, that the peak daily head on the composite liner is less than 12 inches. You must model the combined effect of normal rainfall events and leachate recirculation. The model input parameters must be the same as in the original design (or subsequently approved modifications) or you must justify any deviations.

3. A slope stability analysis if applicable, including a seismic analysis if one is required for the site. The analysis should take into account the increased density of the MSW due to saturation, pore pressures, angles of internal friction, etc., i.e. the changes in the physical properties of the waste mass due to recirculation.

4. An evaluation of the structural integrity of the leachate collection piping using the increased loading due to saturation of the waste mass.

5. A list and description of the proposed equipment and materials, along with their specifications (pumps, force mains, piping, trench backfill materials, etc.)

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6. Estimates of design flow rates, liquid storage, and recirculation capacity to demonstrate that peak leachate generation events can be accommodated utilizing proposed equipment. This will require an evaluation of leachate infiltration rates, waste absorptive capacity, and the maximum head on the liner. It should also include a discussion of whether the recirculation rates are additive (when you have two systems of laterals with vertical separation) or were designed independently.

7. A conceptual layout of the recirculation system, showing horizontal pipe spacing, vertical pipe spacing, and the location of all system components and connections. While the actual field construction may vary somewhat, the general concepts should remain the same. The design flow rates are based on the conceptual layout, so any parameters used in deriving the design flow rates must remain the same.

8. Trench specifications including depth, width, length, type(s) of granular backfill, etc.

9. Provisions for a flow metering system capable of measuring the volume of leachate recirculated into any portion of the system.

10. An outline of inspection procedures to be used to ensure systems are operating properly, along with a description of corrective actions that will be taken to correct system problems or failure. This may include such things as regular inspection of piping, tanks, etc. for leaks, and inspections of the landfill surface and sideslopes for leachate outbreaks.

11. A contingency/emergency plan to be used in the event that the recirculation system becomes inoperable.

12. A detailed operating procedure for the recirculation system. Include a discussion of the phased layout and whether the individual systems (sections of laterals) will be used at the same time or one at a time. The procedures should describe the operation of all pumps, isolation valves and cross-connection valves for all recirculation scenarios proposed (from trucks, from tanks, from ponds). The operating procedures are likely to require adjustment during the first few weeks or months following system construction, or following construction of a new section of laterals. Therefore we will allow these procedures to be modified as necessary as long as the operating parameters are reasonably close to the design parameters. We will require new operating procedures to be submitted within ninety (90) days of initial installation or installation of a new lateral system.

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