

Featured Technical Topic Summary

FGI Monthly Members Meeting

Friday, December 2, 2022



TOPIC: How do know your liner is leaking? If it is, what do I do?

Each month Tim Stark introduces a new technical topic for discussion and possible action. This month's topic is: "How do know your liner is leaking? If it is, what do I do?". This topic generated significant discussion with the main "take-aways" being listed below:

1. Determining whether a liner system is working is difficult. Deciding what to do if the liner system is leaking is also difficult so these two topics generated considerable discussion. This White Paper summarizes the responses to these two issues.
2. **How do you know your liner is leaking? Depends on application but some observations that indicate leakage is occurring are listed below:**
 - i. Changes in liquid/water level but must show that change in level is not due to evaporation
 - ii. Seepage around pond/containment facility
 - iii. Contaminant detection in groundwater monitoring well(s)
 - iv. Pressure transducer – placed in stilling well on opposite sides or in LDZ sump show different liquid pressures
 - v. Add chloride to liquid and conduct subsequent geophysical testing to detect chloride outside of facility
 - vi. Add dye to liquid and monitor adjacent wells
 - vii. Measure flow in Leak Detection Zone (LDZ) if present
 - viii. Check groundwater monitoring wells for changes in constituents
 - ix. Check around and inside facility for subgrade deformations, e.g., ruts, and soft spots especially if the facility is emptied
 - x. **Different applications:**
 - single lined ponds – monitor water level, conduct an electrical leak location survey (ELLS) with full pond and repair leak(s)
 - double lined ponds – check LDZ, pump out every 24 to calculate leakage rate, compare to allowable state leakage rate, conduct ELLS and repair leak
 - tanks – leakage is usually visible
 - landfills – check LDZ, pump out every 24 to calculate leakage rate, compare to allowable state leakage rate, conduct ELLS and repair leak
 - water reservoirs – Monitor changes in liquid/water level but must show that change in level is not due to evaporation
3. **Appropriate Questions when you are contacted about possible leakage:**
 - i. How do you know there is a leak?
 - ii. What is the rate of leakage?
 - iii. Can you send photos of the suspected leakage and geomembrane in area of leakage?
 - iv. What changes in operation occurred?
 - v. What activities occurred in or around the facility, e.g., lawn mowing, equipment on geomembrane
 - vi. What changes in material/liquid being contained?
 - vii. Is changes in liquid/water level due to leakage or evaporation because evaporation can be up to 8 feet in arid areas
 - viii. Are pipes or pipe boots leaking?
 - ix. If double liner system, check LDZ flow rate and chemistry, i.e., is liquid consistent with fluid being contained or water

- x. Does it matter if facility is leaking, e.g., clean water is leaking?
- xi. What is relevant Action Leakage Rate (ALR)? Is leakage above or below ALR?
- xii. How urgent is the problem? (Can you wait a week or two and monitor the leak so do not drain liquid? Also, may not have a crew available.)
- xiii. If suspected leak location is unknown, can liquid/water level be drawn down to determine if leakage slows and/or stops at a particular point?
- xiv. If liquid/water level cannot be drawdown from operating level, will owner/operator be interested in conducting an ELLS?
- xv. If owner/operator wants installer to investigate the leak, is Time & Material rates acceptable if problem is not a geomembrane leak?)
- xvi. Additional questions and observations are described in the FGI Operation and Maintenance Manual for Water Reservoirs at: https://assets-global.website-files.com/5977726d80d12837b9592f43/62c728c28a80e26a6bfb1bfc_FGI-O%20%26%20M%20Manual-Water-Reservoirs-2022-Final-7-7-22.pdf.

4. **Remedies:**

- i. Don't drain liquid/water and monitor for a week or two
- ii. If double lined system with LDZ, use LDZ to reduce/minimize hydraulic head on secondary GM and check chemistry of LDZ fluid
- iii. Lower liquid level slowly until leakage slows and/or stops
- iv. Isolated LDZs = separate sumps – isolate where leak is occurring and measure leak over 24 hours – leakage rate = volume/24 hours and compare to action leakage rate –
- v. 400, 800, 1,200 gallons/acre/day levels of action = Wyoming – Pump every 24 hours
- vi. 2 to 2.5 acres per LDZ with a high point in middle
- vii. LDZ – double-sided geocomposite for landfills or only geonet for water impoundments
- viii. Tank liners – leakage = visible – 30 to 40 mil thick LLDPE and PP – white/black/white layers – easier to find possible leaks – if hazardous, double-lined with LDZ
- ix. Use colored GMs – tan liner v. black liner = hard to find leaks

5. **Future Designs:**

- i. Use double liner system with LDZ not just two GMs; LDZ can be a geonet (water reservoir or pond) or double-sided drainage composite (landfill) depending on application
- ii. Use isolated LDZs with separate sumps so you can isolate where leak is occurring and measure leak over 24 hours – leakage rate = volume/24 hours and then compare to action leakage rate, e.g., Wyoming has a graduated ALR with different responses, i.e., 400, 800, and 1,200 gallons/acre/day action levels. Each isolated LDZ is 2.0 to 2.5 acres with a high point to direct flow
- iii. Use colored GMs – tan liner v. black liner because easier to find defect/leak
- iv. Use conductive geotextile below geomembrane (GM) or in between GMs to show leakage
- v. Install Fiber optics cables under geomembrane detect leakage
- vi. Add water level marks/scale to GM to facilitate measuring liquid level