

Featured Technical Topic Summary

FGI Monthly Members Meeting

Friday, November 4, 2022



TOPIC: Sample Coupons to Evaluate Remaining Service Life

Each month Tim Stark introduces a new technical topic for discussion and possible action. This month's topic is: Sample Coupons to Evaluate Remaining Service Life. This topic generated significant discussion with the main "take-aways" being listed below:

1. Estimating remaining service life is important for owner's replacement and budgeting purposes. This is gaining popularity in Australia, South America, and west and southwestern portions of the United States. As a result, a main objective of this White Paper is to educate engineers and owners on how to design, specify, and include sample coupons in their designs and installations, respectively. Most of this White Paper focuses on new projects except for the last section which focuses on old projects.
2. Main issues identified regarding sample coupon for evaluating service life are listed below and addressed in subsequent bullet points:
 - i. Coupon Locations
 - ii. Exposure Locations
 - iii. Coupon Labeling
 - iv. Coupon Size
 - v. Attachment or Anchoring
 - vi. Testing Frequency
 - vii. Tests Required
3. **What is a Coupon?**
 - a. A sample coupon is extra parent geomembrane material and possibly a field seam that is stored inside the facility until it is retrieved for testing to assess the remaining service life of the geomembrane. The sample coupons consist of the parent geomembrane and may or may not include field seam coupons to assess long-term performance of the field seaming.
 - b. Preserving the sample coupons is the responsibility of the end user or owner of the containment system and should be an integral part of their ongoing long term Operation and Maintenance Program.
 - c. Most of the
4. **Coupon Locations**
 - a. On top of floating cover – evaluate UV exposure
 - b. Underneath floating cover near or attached to an access hatch – evaluate vapor exposure
 - c. Below fluid level - assess chemical resistance
 - d. Above fluid level in exposed applications - evaluate UV exposure
5. **Exposure Locations**
 - a. In North America – samples above fluid level on south (high exposure) and north (low exposure) facing slopes for aging comparison
 - b. In Australia and South America – samples above on north (high exposure) and south (low exposure) facing slopes for aging comparison
6. **Coupon Labeling**
 - a. Each sample should be labelled, e.g., test sample, in permanent ink so many years later people understand the purpose of the samples
 - b. In North America – samples on south (high exposure) and north (low exposure) facing slopes
 - c. In Australia and South America – samples on north (high exposure) and south (low

exposure) facing slopes

7. Coupon Size

- a. Sample size will depend on testing that will be conducted at each testing interval, e.g., 5 years
- b. Typical sample size is 18" x 36" (46 cm x 92 cm)
- c. "Retained samples" also should be taken during initial installation of the geomembrane and archived by the owner so the manufactured properties can be determined at a later date if needed – a typical "retained sample" is the width of the geomembrane roll with a length of 3 ft (1 m). The retained sample(s) should be stored by the owner in a warehouse or other secure location.
- d. Material for future repair of the geomembrane also should be obtained during initial installation and archived by the owner if the geomembrane needs to be repaired in the future

8. Attachment or Anchoring

- a. Samples can be stitched bonded to the parent geomembrane by welding of the sample corners to the parent via a hot air welder or solvent
- b. This welding would be used for the cover system geomembrane and the geomembrane exposed above the fluid level
- c. Samples placed below the fluid level can be anchored to the bottom of the pond or reservoir by an attached weight or can be extended below the fluid level from the anchor trench

9. Testing Frequency

- a. Typically samples are retrieved every five (5) years for testing over the projected service life of the geomembrane, e.g., 20 years

10. Tests Required

- a. The tests required will depend on the type of geomembrane installed
- b. Polyolefin and polypropylene based geomembranes will usually be tested using high pressure oxidative induction time (HPOIT) tests (ASTM D5885) to assess the level of remaining oxidants so small coupons can be stored
- c. Other polymer based geomembranes, e.g., PVC, CSPE, EPDM, will usually be tested to determine if one or more of the initial engineering properties, i.e., tensile or tear strength, has been reduced by 50% or more so large coupons need to be stored because the specimen size for these tests can range from 1" to 4" wide and 2" to 4" long. In addition, analytical testing by mass spectrometry is an option (expensive) for detecting degradation/loss of polymer components via changes in the molecular weight over time.

11. Old Projects

- a. The main issue for sample coupons for an old or pre-existing project is sample coupons were probably not installed during initial installation as described above. As a result, a sample of the in-service must be obtained causing a breach in the liner system, which must be repaired. This is problematic because original parent material is probably not available and welding a patch of new geomembrane to the pre-existing geomembrane may be challenging.
- b. The first sample location should be chosen to evaluate whether or not the pre-existing geomembrane can be patched so this location should be above the liquid or solid level in the facility just in case the geomembrane cannot be patched.