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Bridging Water and Wastewater Containment System Gaps

BY TOM PRIEST

Although water and wastewater treatment vessels are engineered to be foolproof, eventual leakage from these vessels caused by mechanical or chemical influences can pose serious threats to the health and safety of workers, the public, and the environment they're intended to protect. Leaking containment systems also result in unplanned downtime and diminished capacities, as well as time-consuming, expensive, and recurring repairs.

As safe as they may be initially, many water and wastewater containment structures depend on the integrity of containment system linings—often consisting of coatings—to provide long-term, thorough protection against leakage. Several products are designed to prevent the leakage of aqueous materials housed in primary and secondary containment structures, but they may still fail because of chemical and mechanical challenges.

A HOST OF CHALLENGES

A wide array of chemicals used in water and wastewater treatment operations presents challenges for primary containment vessels. Such chemicals include hydrogen sulfide, sodium hydroxide, sulfuric acid, sodium hypochlorite, and chlorine, as well as many other harsh, industry-specific chemicals, such as nitric or hydrofluoric acids. These chemicals attack steel and concrete in process or storage tanks, clarifiers, thickeners, cooling towers with concrete bottoms, concrete tanks, and concrete bottoms in steel-walled clarifiers and thickeners.

Mechanical problems include abrasion or erosion of primary containment linings caused by solid contaminants and cracking of concrete substrates used for primary containment vessels (e.g., the bottoms of clarifiers). Because linings on steel or concrete substrates often lack high permeation resistance, a lining's top coat can blister. The blisters indicate the lining is failing because of molecular vapor transmission through the lining.

Although secondary containment dikes are required to enclose leaks and spills for a 72-hour period, most chemicals will damage the lining during that time, which compromises the dike's integrity and necessitates costly, time-consuming maintenance and downtime. Most polymers are further degraded by concrete movement and cracking caused by ultraviolet (UV) rays.

So choosing the right material to line primary and secondary containment vessels and dikes is critical, particularly in water and wastewater treatment facilities that are in demand around the clock.

THE ELASTOMERIC BRIDGE

The basis for containment systems is that

- concrete will crack.
- hazardous materials, if spilled, will leak into the ground and contaminate groundwater.
- a coating or lining must not crack or leak.

A solution to these combined threats is an engineered elastomeric lining system that can be applied to primary and secondary containment structures. Easy to install, the elastomeric lining is noteworthy for its long life, ability to bridge concrete joints and cracks, and imperviousness to UV light and harsh chemicals.

Soil remediation can be avoided by using a crack-bridging elastomeric lining. In addition, the crack-bridging property doesn't affect the lining's chemical resistance. If the lining is resistant to the intended chemicals, it will also bridge moving concrete cracks to ⅛ in. and larger.

Florida (Juno Beach) Power & Light (FP&L) had used 100 percent epoxy coatings on its secondary containment structures. The utility discovered that epoxy worked well for some primary containment applications but not for concrete structures. "In concrete structures, live cracks will occur. Because epoxies are a rigid coating, they tend to crack right along with the concrete," says Brian Peroni, the utility's corrosion control specialist. "As a result, you have continual maintenance to seal the cracks as they occur."

FP&L's typical secondary containment is basically a concrete dike consisting of a wall and base around the facility's primary tanks, according to Peroni. The tanks contain various liquids, ranging from harsh, low-pH chemicals (e.g., 98 percent sulfuric acid) to highly caustic solutions with a pH of 10–12. Tanks located in Florida are subject to a lot of sunlight, which contributes to concrete dike cracking.

A STRONG CHOICE

One of the main benefits of using an elastomeric lining on containment and other concrete structures is that the lining overlays concrete joints, so joint problems are eliminated. Further, if you tried to remove a liner from concrete, you'd have to exert more than 500 psi in pulling strength, because the liner's tensile strength exceeds that of concrete.

This type of lining can be applied over expansion and control joints in concrete structures, which can save considerable installation time and cost. As water and wastewater treatment facilities are continually exposed to hazardous chemicals, leaks can be costly for the facility and the environment. Therefore, containment vessels need linings that can "bridge" structural cracks, resist harsh chemicals, and provide complete protection against leakage over time.