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Corrosion prevention in aboveground storage tanks

Pollution, public health and billions of dollars in direct and indirect costs: Leaking aboveground storage tanks (ASTs) can create major problems. And one of the primary reasons for storage tank failure is corrosion. Now, with newer concentric-ring cathodic protection technology, however, a corrosion prevention system can be designed to protect ASTs and keep them structurally sound for 100 years or more.

Concentric-ring systems for ASTs include factory-assembled anode rings that come equipped with the appropriate cable leads to extend past the ring-wall penetration. No on-site field assembly is required, nor is cutting, splicing or welding.

Grid anode vs. concentric ring systems

While field-fabricated grid-anode systems have been used for decades, installation presents challenges because they cannot be installed directly over the containment liner. The ribbon anode and titanium conductor bars must be field-cut and welded on-site, making the welds subject to failure. Sand installation can damage spot welds, and care must be taken to hold the system in place so that it does not short-circuit to the tank bottom. Additionally, bare mixed metal oxide (MMO) electrodes in sand generate oxygen, which is a depolarizer and may lead to issues with maintaining polarization criteria.

Unlike the grid system, in a concentric-ring system, the MMO wire is contained within a braided fabric sleeve with coke backfill. A byproduct of coal coke production, coke backfill is commonly used in cathodic protection because it compacts easily and offers good conductivity at lower moisture levels. The coke backfill creates an environment that inhibits the generation of oxygen to eliminate depolarization issues. Further, concentric-ring systems allow for the independent monitoring and control of individual tanks, reduce stray current and last longer.

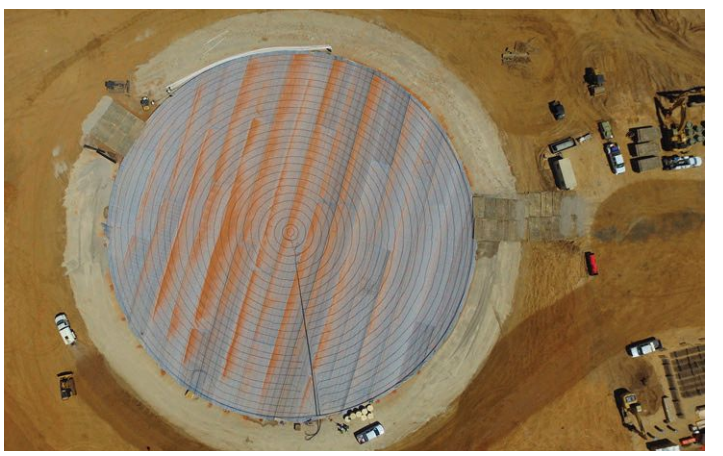
Best practices

For large ASTs built on ring-wall foundations, the generally accepted "best engineering practice" is to install impressed current cathodic protection to protect the tank bottom. For either a new tank or a tank bottom replacement, you will want to start with the right foundation: sand that has been screened and cleaned, is free of debris and chloride-free, and has a pH >7. Chlorides act as a depolarizing agent, affect resistivity and increase current requirements; higher pH levels decrease corrosion rate.

Today, federal regulations (40 CFR Part 112) also direct ASTs to be constructed with a secondary means of containment. While plastic sheet liners can be used, a geosynthetic clay liner (GCL) offers advantages. GCLs feature a layer of sodium bentonite sandwiched between two layers of geotextiles. Sodium bentonite swells to many times its original mass, forms a strong seal, is largely self-repairing and provides the same secondary containment function as plastic while allowing for a better flow of electrical current.

A typical under-tank cathodic protection system will last in excess of 50 years, and they can be designed to extend life beyond 100 years.

For more information, contact Ted Huck at (267) 759-3605 or thuck@matcor.com. ●



A concentric-ring cathodic protection system with a 100-plus-year design life.