

Understanding Cathodic Protection Systems

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Is part of your underground fuel tank system steel? Do you wonder why it doesn't rust out quickly? If the system was installed properly, all metal parts are being cathodically protected in one of three ways: cathodic isolation, galvanic (sacrificial) anode system, and impressed current system. Although these systems may seem very confusing, they are really quite simple to operate and manage.

Cathodic isolation is simply preventing the metal from coming in contact with the corrosive environment, i.e. water or backfill. Without the water or backfill electrolyte, the corrosion cell is not complete, and corrosion is safely minimized or eliminated. This type of cathodic protection is generally used with metal pipe fittings and is relatively maintenance free. Your only concern is that the isolation boot is tight and no metal is exposed. If you remove the backfill that has built up around the metal fittings, and do not install an isolation boot, you need to make sure that the fitting does not come in contact with backfill again. If you have a groundwater problem, where the metal is under water for extended periods of time, you must find a way to keep the water away from the metal, or find another method of cathodic protection.

Galvanic (sacrificial) cathodic anode protection is a self contained cathodic protection system. The anodes are attached directly to the tank or piping, and nearly everything is kept below the ground surface. In this type of installation, the metal has to be in contact with the backfill or water to work properly. One of the more common applications of this method is the STI-P3 tank. The anodes are fastened directly to the steel tank in the factory. Another common application of this method is on metal fittings below dispensers and at submersible pumps that are not contained, i.e. the "spike anode." The anode is attached to the metal fitting with a lead wire and clamp. With this type of application, you must routinely inspect each lead wire and clamp to make sure it has a good connection to the metal fitting. However, in most installations, there is very little for you to do other than have it tested, or recertified every three years. The certification must be reported on the Iowa DNR UST Cathodic Protection Inspection Form. You need to keep the two most recent certifications in your files. Having the system recertified is very important because these systems will wear out over time, and the sooner you correct the problem the less likely you are to have a major fuel release from your tank system. If your system fails the recertification, you must notify your insurance provider and the DNR immediately. From there, you will need to make arrangements with a cathodic protection installer to adjust the system to meet minimum industry standards.

Impressed current protection systems require a little more management. With this type of installation, the tank system and anodes are below the ground surface, similar to the galvanic sacrificial system; however, the system is energized with electricity and the wiring runs from the structure being protected to the building and back out to the anodes. The anodes are buried around the structures to be protected. Inside the building, there is a rectifier control box that hangs on the wall and is usually located in the back room by the tank monitor. This box has a power indicator light (red/green) and usually several gauges as well: hour meter, amp meter and volt meter. Every month, you should be recording all of these values, as well as going outside to inspect the wiring runs to make sure that none of the wires are exposed to vehicle traffic. If any of these wires get

damaged, part of your cathodic protection system will no longer operate, therefore, not protecting your system adequately. At most sites, the wiring was installed through the concrete in a "saw cut." Once the wiring was inserted in the saw cut, it was sealed with a packing and caulking material. The wiring should never be exposed to the surface at any part of the system. Impressed current systems must be recertified every three years, just like the galvanic sacrificial system. In addition to filing the two most recent certifications, you must maintain the rectifier log as described earlier. Any certification failures must be reported immediately, similar to the galvanic sacrificial system.

Cathodic protection systems are much more complicated when you get into the physics and chemistry involved, but that is for the certified testers to understand. If you can remember to follow the very simple guidelines I have explained in this article, you should have very little trouble with metal corrosion in your underground tank system.