



What Do an Aircraft Carrier and LPG Systems Have in Common?

By Richard W. Dougall

The answer is simple—the need for cathodic protection against corrosion. Granted, the object of corrosion protection of an aircraft carrier is to maintain the steel hull (infrastructure), prevent leaks, and to keep water out; and the protection of a propane tank and piping is to maintain the steel (infrastructure), prevent leaks, and keep the propane in, but otherwise they are very similar—to take advantage of modern methods of corrosion prevention to preserve the infrastructure and prevent leaks.

A good case in point is the upgrading of the cathodic protection system of the aircraft carrier *USS Midway*, now permanently docked and used as a maritime museum in San

Diego, Calif. In August, this historic treasure had its 70-year-old cathodic protection system upgraded by Cary Schmoltdt and Lance Thomas of Anode Solutions (Frisco, Texas) and Hans Schmoltdt of its affiliate, Anode Systems Co. (Grand Junction, Colo.).

Thomas explained that the impressed current cathodic protection (ICCP) system being installed provides key benefits—it's user-friendly, and it's easy to replace anodes if they are physically damaged. That's an important issue when there are 30 anodes and their connections suspended from the hull that can be damaged by other boats or barges.

The ICCP system he installed on the *Midway* utilizes two rectifiers to convert AC current to DC, a 300-A unit in the bow area and a 450-A unit in the stern. The ICCP system can prevent the steel from losing electrons

and becoming susceptible to corrosion (see sidebar on p. 22).

The anodes are small mixed metal oxide rods, protected by a perforated PCV shield. They should “last forever,” Thomas explained, barring physical damage.

“We’re trying to preserve part of history,” he commented, and he already has big notches on his belt—he’s installed a cathodic protection system on the battleship *Texas*, docked near Galveston. The *Midway* is a key tourist draw for San Diego, so having the ship out of commission in dry dock for repairs would be a major issue, Thomas said.

Once the system is fully installed, maintenance will be easy, as current draw can be monitored and recorded. If any abnormalities in the current draw become evident, it becomes a straightforward troubleshooting

scenario to see if an anode has lost its connection or has been physically damaged.

Having a functional, user-friendly cathodic protection system will make life easier for Scot Whaley, facilities manager. With approximately 50 people in his department, including maintenance team, service technicians, electricians, welders, plumbers, and more, he can focus on issues above the water line.

Corrosion is like a cancer, says Hans Schmoltdt. By properly engineering and installing a cathodic protection system, damage can be prevented. He stresses that underground propane systems—both tanks and piping—can be protected. Options range from sacrificial anode galvanic systems to ICCP systems like that installed on the *Midway*. New updates to the National Fire Protection Association’s NFPA 58 call for cathodic protection of underground tanks and piping (see p. 18).

How important is protection of a ship like the *Midway*? “Protecting the hull is the crux of my existence,” said Charles Gordon, chief engineer and director of facilities at the USS Midway Museum. Without an intact hull, “none of us would have a job.”

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The USS Midway CV-41

- Commissioned 1 week after the end of WWII
- 1001 feet long
- Weight: 70,000 tons
- Two anchors, each weighs 20 tons
- Four propellers, each 18 feet in diameter
- Crew numbered 4500 men
- Longest-serving U.S. Navy carrier of the 20th century and largest ship in the world from 1945 to 1955
- Most-visited floating ship museum in the world: 4.1 million visitors in 5 years (2004-2009); over 1 million in 2012, and already more than 1 million in 2013
- Comprehensive education program at Midway University, hosting more than 30,000 K-12 students annually with curriculum-sanctioned, hands-on math and science labs and field trip activities



Assembled ICCP anodes (in perforated PVC protective sleeves) lie on a barge awaiting installation, above. At right, Lance Thomas of Anode Solutions crimps cable connections for the *USS Midway*. The final result, far right, is 30 anodes protecting the hull of the aircraft carrier against exterior corrosion. Not huge in size, but mighty in their power.

