TANK BOTTON CORROSIONESOLVED

Merrick Alpert, EonCoat, USA, describes how a weldable coating has been designed to protect welded tank bottoms from corrosion.

Figure 1. Welding tank bottom plates in place.

oneywell International Inc. needed to solve a problem at its Geismar, Louisiana, US plant that plagues the LNG and petrochemical industry: how to prevent corrosion on the soil facing side of a tank. This problem costs large LNG and industrial companies billions of dollars a year, and until recently there was no solution.

Traditional paint does not work because if the painted steel is welded, the paint on the soil facing side will burn off and create a corrosion cell that immediately begins rusting. Cathodic protection does not work because the required voltage cannot be maintained over the large, uninsulated metal surface in contact with the ground.

Honeywell, like many of the largest LNG and petrochemical companies in the world, typically leave the tank bottoms unprotected and accept as inevitable the enormous cost of repair, replacement, and downtime that is guaranteed to occur as the steel corrodes. Fortunately for Honeywell, Controlled Maintenance, Inc. (CMI) delivered a solution. CMI, with vast industrial maintenance services experience, showed Honeywell that a coating had been developed that could be applied to the soil facing side of the tank and then safely welded with no damage caused to the coating.

CMI's long history of both tank bottom construction and tank bottom repair had led the company to search for a better solution for Honeywell and its other customers throughout the US. CMI's decades of experience led the company to conclude that tank bottoms represented the most frequent failure point caused by premature corrosion. The problem was even more prevalent for tanks welded in place at a tank farm.

CMI had learned about the tank bottom solution from Asset Protection Solutions, a New Orleans-based company that represents the EonCoat anti-corrosive coating in the US Gulf Coast region Asset Protection Solutions' technical team worked with CMI to support the project, which involved an EonCoat coating on the tank bottom steel panels at CMI's Gonzalez, Louisiana, US facility before the panels were transported to Honeywell's Geismar HCL unit. The panels coated with EonCoat were then welded in place as the tank was fabricated in the tank field. "The coating held during the weld, it held during the construction, and even held well during transport," said Don Bourg, CMI's Vice President of Operations who oversaw the project. "This coating will perform without being compromised by internal welding."

Orhan Ergün, Managing Director of Asset Protection Solutions, provided insight into the team-based solution that CMI and Asset Protection Solutions delivered together to Honeywell. "We were deeply committed to working with our friends at CMI to deliver a world class solution to Honeywell. And we are equally committed to sharing this breakthrough solution to tank owners throughout the Gulf Coast region."

Sarah LeBlanc, Sales Manager for Asset Protection Solutions in Louisiana, US, was instrumental in originating and managing the project to fruition. "We worked with the team at CMI to assess, identify, and specify the right solution. And for tank bottom coating, EonCoat is the right answer."

Weldable coating

Unlike traditional polymer coatings that burn up when welded, EonCoat is inorganic and non-flammable. Made entirely of minerals, the coating will not burn. Welding the panels together on the floor of the tank does not damage the coated soil facing side of the steel.

Don Bourg, who oversaw the welding operation on the Honeywell tank, summarised the result by saying: "The coating was 100% intact before I left the site."

Unlike paint, which only serves as a barrier coating over the substrate, EonCoat prevents carbon steel from corroding by chemically reacting with the steel. The result is that the coated surface of the steel is an alloy that is inert and will not react with the elements. Neither oxygen nor moisture will react with the alloy. Corrosion cannot occur.

Since the alloy layer, made of iron, magnesium, and phosphate, is chemically bonded to the steel, nothing can get past or beneath EonCoat's alloy layer. In comparison, paint is just a barrier that sits on top of the steel profile. There are gaps where the profile is low. Oxygen, moisture, and salts make their way through the inevitable cuts and gouges in the paint. These corrosion promoters weave their way around these gaps underneath paint over time and create the rust blisters that are so often seen.

When EonCoat is spray applied to steel, a ductile ceramic layer forms over the alloy layer. The result is two layers of corrosion protection. The alloy layer is chemically bonded to and part of the steel, and the ceramic layer is chemically bonded to the alloy layer.

The ceramic layer functions as a phosphate reservoir, allowing the coating to self-heal if it is mechanically damaged.



Figure 2. Two plates coated with EonCoat weldable coating being welded together.

Phosphates in the ceramic will migrate to the steel to protect it from corrosion, as needed. The result is corrosion protection for the life of the asset, with a single application.

Benefits

EonCoat delivered the solution to Honeywell's primary concern – preventing tank bottom failure. By using this coating, Honeywell should never have to replace the tank bottom again. If EonCoat is not used, the cost of repairing or replacing the bottom of a tank, and the associated lost production opportunity (LPO) asset downtime, is often hundreds of thousands of dollars. The cost of using EonCoat is similar to the cost of an industrial paint system. But unlike paint, EonCoat's weldable coating withstands a temperature of 600°C (1112°F).

The coating also delivers a series of health, safety, and environmental (HSE) benefits to Honeywell, its employees, the community, and Honeywell's shareholders, that cannot be obtained with traditional paint. The coating is non-toxic and non-flammable – even when welded – so the result is a safer work environment for Honeywell's employees and contractors. Furthermore, since EonCoat is water-based and inorganic, it contains no volatile organic compounds (VOCs), no hazardous air pollutants (HAPs), and no odour.

Honeywell also benefits from the high degree of impact and abrasion resistance the coating delivers to protect the steel.

Ease of application

Unlike paint, EonCoat does not need to be applied to white metal. The coating is successfully applied over flash rusted steel. For the Honeywell tank, CMI followed the NACE 3/SSPC SP 6 commercial blast standard and then allowed the steel to flash rust until CMI was ready to apply EonCoat.

The elimination of the need to spend time blasting to a white metal standard and then rapidly applying primer before rust bloom develops is one of the ways in which EonCoat delivers labour cost savings and faster return to service to asset owners such as Honeywell.

It can also be applied on damp steel. As CMI experienced, this allows the coating to be applied even in weather conditions when traditional paint could not be used.

CMI applied the 1:1 plural component coating using a basic plural component pump and a Graco G40 spray gun. Clean-up is undertaken with only water, as the water based EonCoat does not require solvent. Moreover, it is applied at atmospheric temperature. There are no heated lines or heated hoppers.

EonCoat's tank bottom coating is a one coat product. No topcoat is used with this weldable coating. EonCoat's President Merrick Alpert summarised the project on behalf of all of the participants: "We are honoured to work with CMI and Asset Protection Solutions to deliver this breakthrough technology to a great company, Honeywell International. Along with the EonCoat project team at CMI and Asset Protection Solutions, we welcome the opportunity to protect the large number of tanks located throughout the Gulf region."

Looking forward, the scourge of tanks rusting out from the soil facing side and constant replacement of tank bottoms is over. After decades of struggle there has been a solution created that works. EonCoat is designed to be easy and safe to apply and will last for the life of the tank. It can be used with or without cathodic protection, effective either way. The intention is that tank owners will no longer have to include time and money to replace bottoms in their budget. LNG