

A More 'Permanent' Solution to Protecting Carbon Steel Structures from Corrosion

Using Innovative coatings prevents corrosion of steel structures and appurtenances exposed to standing water, high humidity common in water treatment operations.

In water treatment operations, which include the plant itself as well as the infrastructure required to collect and distribute water from sources such as aqueducts, reservoirs, lakes and rivers, the wet, high humidity environment can wreak havoc on steel structures and appurtenances such as pumps, piping, pipe supports, and other critical equipment.

Since corrosion can cause leaks or premature failure of equipment, maintenance personnel are often tasked with monitoring, repairing or re-coating carbon steel items as needed. However, these are little more than temporary solutions that last a few years at best and with equipment scattered in various locations over hundreds of miles, sending staff out regularly is both impractical and expensive.

Fortunately, there is a new type of coating that promises to deliver a more permanent solution for water treatment operations. Unlike traditional coatings,

the product bonds best with corroded surfaces – so much so that flash rust is often intentionally allowed to form prior to application – to create an alloy barrier that can prevent corrosion for decades.

The coating is not only NSF safe for use with water, but can be applied to rusted equipment while it is in service, and is safe for application in underground vaults or other enclosed structures.

Controlling Corrosion

“The total annual direct cost of corrosion for drinking water and sewer systems is \$36 billion, which includes the costs of replacing aging infrastructure, lost water from unaccounted-for leaks, corrosion inhibitors, internal mortar linings, external coatings, and cathodic protection,” states the NACE International report *Corrosion Costs and Preventive Strategies in the United States*.

The San Diego County Water Authority, an independent public agency that provides a safe, reliable supply of water to 24 member agencies serving the San Diego, CA region’s 3.3 million residents, sought to improve its anti-corrosion maintenance program. The agency owns and operates

extensive infrastructure including about 310 miles of pipeline and 3,000 mechanical units that move the water through the pipeline system.

Much of the Water Authority’s aqueduct system relies on the use of carbon steel appurtenances in underground vaults, which are often subjected to high levels of moisture and, at times, submersion in standing water. The agency spends significant resources each year attempting to prevent these steel assets from corroding.

To address these issues the Water Authority turned to EonCoat®, a spray applied inorganic primer from the Raleigh, North Carolina based company of the same name. The primer is actually a Chemically Bonded Phosphate Ceramic (CBPC), one of the first of a new category of coatings designed to stop corrosion, ease application, and reduce downtime.

In contrast to traditional polymer and zinc coating that sit on top of the steel substrate, the corrosion resistant CBPC primer bonds through a chemical reaction with the substrate and slight surface oxidation actually improves the reaction.

When applied to carbon steel, an alloy of stable oxides is formed that will no longer react with the environment and will protect the steel from corrosion. This corrosion barrier is covered by a ceramic layer that resists corrosion, water, abrasion, impact, chemicals, fire, and temperatures up to 400 °F. The double layer of protection – the alloy layer and the ceramic layer – makes it impossible for corrosion promoters like oxygen and humidity to get beneath the coating.

“We pride ourselves on being ahead of the curve for all types of technology... includ[ing] the ever-changing coating industry,” says Daryl Akioka, the Water Authority’s project manager for the coating application. “Although most of our assets are underground, it has been a challenge to get proper protection for our above ground appurtenances, too. We are hopeful that EonCoat can supply a solution to aggressive maintenance schedules and annual recoating of problematic appurtenances.

In the Water Authority project, the agency used a planned outage on part of their aqueduct system to apply the CBPC primer to seven carbon steel mechanical

appurtenances, including a 12-inch blow off, 36-inch turnout pipe elbow, two 8-inch pump wells, and three 10-inch air release valve assemblies.

The appurtenances were removed from their below grade vaults and transported to a blasting and coatings facility, where they were degreased and blasted to a NACE 3/SSPC-SP 6 level and allowed to flash rust. With traditional industrial coatings, a more labor intensive, time consuming, near white metal blast cleaning (NACE 2/SSPC-SP 10) is typically required to prepare the surface.

EonCoat, which previously achieved NSF certification and won the NACE 2015 Corrosion Innovation of the Year Award in the coatings and linings corrosion control category, was then spray applied at a coating thickness of 20 to 25 mils.

Typically, a topcoat can be applied within one hour of applying the CBPC primer due to its rapid drying and curing time. Because it rained during several days of the project, resulting in high humidity in the spray area, the primer was allowed to cure for twice the time – two hours – before the topcoat was applied. In contrast, for

standard three-part coating systems the cure time can be days between coats, depending on the product

The equipment was then transported back to the underground vault, reinstalled and successfully returned to service by the Water Authority.

Application of the CBPC primer is now being considered for a number of carbon steel in service structures by various water authorities around the country. Since the CBPC primer is inorganic and non-toxic, there are no VOCs, no HAPs and no odor involved. This means the water soluble, non-flammable primer can be safely applied in vaults and other confined spaces.

Although CBPC coatings are relatively new in municipal water applications, their use will only grow as word spreads about how they can inhibit carbon steel corrosion for decades as well as reduce premature maintenance and appurtenance replacement. ■

For more information, call 754-222-4919; visit www.eoncoat.com; or write to EonCoat, LLC at 551 Pylon Drive, Unit D, Raleigh, NC 27606.

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