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STOPPING CORROSION IN THE Utility INDUSTRY

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STOPPING in the Utility

From gas distribution, drinking water, and sewer piping to electric transmission, distribution, and substation structures, to telecom towers, much of the utility industry's carbon steel facility infrastructure is aging and now between 40 and 100 years old. Consequently, the cost of corrosion is on a path to dramatically escalate.

Utilities — which supply gas, water, electricity and telecommunications services — account for the largest portion of annual industrial corrosion costs, with direct corrosion costs totaling $47.9 billion, according to NACE International's report Corrosion Costs and Preventive Strategies in the United States.

The Electric Power Research Institute (EPRI), a nonprofit scientific research organization, estimates that corrosion cost the electric power industry $17 billion in 1998, of which "about 22 percent of the corrosion costs were considered avoidable."

Once corrosion starts, often through a breach in traditional barrier-type coatings such as epoxies or polyurethanes, the coating can act like a greenhouse, trapping water, oxygen and other corrosion promoters. This allows the corrosion to spread quickly under the coating itself, which is difficult to inspect, and can lead to failure and costly premature replacement. For these reasons, such coatings are routinely reapplied at a sizeable cost in facility downtime, surface preparation, and coating application.

"Corrosion is a never-ending problem to utility facility infrastructure, and everything made of steel is at risk," says Scott Taylor, President of Taylor's Industrial Coatings, a Lake Wales, Fla.-based industrial coatings contractor. "Steel structures are typically recoated every 7-10 years, depending on environmental factors such as rainfall, humidity, and proximity to a marine environment."
Now a new generation of anti-corrosion coatings, called Chemically Bonded Phosphate Ceramics, is poised to cost-effectively stop such corrosion, improve safety, and significantly extend utility industry infrastructure and facility life while minimizing maintenance and downtime.

Protecting Utility Assets for Decades

In contrast to traditional polymer coatings that sit on top of the substrate, the corrosion resistant CBPC coating bonds through a chemical reaction with the substrate.

EonCoat does not leave a gap between the steel and the coating because the bond is chemical rather than mechanical.

"Utilities are looking for better corrosion coatings that extend the usable lifespan of their facilities while minimizing the need for coating reapplication," says Taylor, whose company has coated a wide range of utility infrastructure including gas and circulating water piping, waterbox/tubesheets, boiler structures, turbine decks and enclosures, CT inlet filter houses, interior/exterior tanks, as well as transmission/distribution poles and towers.

To address these issues, the company turned to EonCoat, a spray-applied inorganic coating from the Raleigh, N.C.-based company of the same name. EonCoat represents a new category of tough, Chemically Bonded Phosphate Ceramics

CORROSION Industry

By Del Williams

(CBPCs) that can stop corrosion, ease application, and reduce production downtime. Recognized as an industry leader, EonCoat won the NACE 2015 Corrosion Innovation of the Year Award in the coatings and linings corrosion control category. In contrast to traditional polymer coatings that sit on top of the substrate, the corrosion resistant CBPC coating bonds through a chemical reaction with the substrate, and slight surface oxidation actually improves the reaction. An alloy layer is formed. This makes it impossible for corrosion promoters like oxygen and humidity to get behind the coating the way they can with ordinary paints.

Although traditional polymer coatings mechanically bond to substrates that have been extensively prepared, if gouged, moisture and oxygen will migrate under the coating's film from all sides of the gouge.

By contrast, the same damage to the ceramic-coated substrate will not spread corrosion in utility facility infrastructure because the carbon steel's surface is turned into an alloy of stable oxides. Once the steel's surface is stable (the way noble metals like gold and silver are stable) it will no longer react with the environment and cannot corrode.

Visible in scanning electron microscope photography, EonCoat does not leave a gap between the steel and the coating because the bond is chemical rather than mechanical. Since there is no gap, even if moisture was to get through to the steel due to a gouge, there is nowhere for the moisture to travel, which effectively stops corrosion in utility industry applications.

The corrosion barrier is covered by a ceramic shell that resists corrosion, fire, water, abrasion, impact, chemicals, and temperatures up to 400 °F. Beyond this, the ceramic shell serves a unique role that helps to end the costly maintenance cycle of replacing typical barrier type coatings every 7-10 years.

"If the ceramic shell and alloy layer is ever breached, the ceramic shell acts as a reservoir of phosphate to continually realloy the steel," explains Merrick Alpert, President of EonCoat. "This 'self heals' the breach, depending on its size, and stops the corrosion if necessary. This capability, along with the coating's other properties, enables effective corrosion protection for the life of in-service structures with a single application."
Because of the dual layer of corrosion protection and unique self-healing capability of the alloy layer, the coating is expected to last a minimum of 30 years and carries a 30-year warranty.

For such durable corrosion protection, Taylor's Industrial Coatings has recently successfully spray applied EonCoat to 3,000 linear feet of 24" gas pipe at an electric power generation facility in the southeast U.S.

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EonCoat's self-healing capability, a[l]so e coating's other properties, enables effective corrosion protec[tion] of in-service structures with a single application.

"The new anti-corrosion approach essentially triples the expected lifespan of traditional coatings and is much more cost effective in the long run for utility facility and infrastructure managers who want to protect their assets," says Taylor. "We plan to use it in a wide range of carbon and mild steel applications in the future."

Utility industry operation managers or corrosion engineers looking to reduce costs are also finding additional advantages to CBPC coatings like EonCoat beyond corrosion resistance.

Such coatings consist of two non-hazardous components that do not interact until applied by a standard industrial plural spray system like those commonly used to apply polyurethane foam or polyurea coatings. Since CBPC coatings are inorganic and nontoxic, there are no VOCs, no HAPs and no odor. This means the water-soluable, non-flammable coatings can be applied safely even in confined spaces.

One of the greatest benefits, however, is quick return to service that minimizes facility downtime. The time saved on an anti-corrosion coating project with the ceramic coating comes both from simplified surface preparation and expedited curing time. With a typical industrial coating, near white metal blast cleaning (NACE 2 / SSPC-SP 10) is required to prepare the surface. But with the ceramic coating, only a NACE 3 / SSPC-SP 6 commercial blast cleaning is typically necessary.

For corrosion protection projects using typical polymer paints such as epoxies or polyurethanes, the cure time may be days or weeks before the next coat of traditional 'three part systems' can be applied, depending on the product. The cure time is necessary to allow each coat to achieve its full properties, even though it may feel dry to the touch.

With traditional coatings, extensive surface preparation is required and done a little at a time to avoid surface oxidation, commonly known as 'flash rust,' which can require re-blasting.

Prior to coating with EonCoat.

"PERHAPS THE BIGGEST ADVANTAGE WITH EONCOAT IS THAT THERE'S NO WORRY ABOUT SURFACE PREP," SAID NEWBURN. "YOU CAN BLAST THE ENTIRE SURFACE, THEN COAT IT WITHOUT CONCERN OVER LOSING AN ACCEPTABLE BLAST.

"Typically you need to keep an SP 10 throughout the entire blast operation, cleaning operation, and painting operation with traditional coatings," said Wesley Newburn, a Quality Control Manager for Mobley Industrial Services, a multi-service specialty contractor. "You may need to rent D-H equipment because humidity above 60 percent will oxidize the surface and require re-blasting."

In contrast, a corrosion-resistant coating for carbon steel utilizing the ceramic coating in a single coat requires almost no curing time. Return to service can be achieved in as little as one hour. This kind of speed in getting an asset operational again can potentially save many thousands of dollars per day in reduced utility facility downtime.

"Perhaps the biggest advantage with EonCoat is that there's no worry about surface prep," said Newburn. "You can blast the entire surface, then coat it without concern over losing an acceptable blast. There's no need for D-H equipment because the ceramic coating can be applied when it's wet or humid. A little surface oxidation makes it adhere better."

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.

Del Williams is a technical writer based in Torrance, Calif.

After coating with EonCoat, the substrate is covered by a ceramic shell that resists corrosion, fire, water, abrasion and caustic elements, as well as oven-hot temperatures.