Water and Wastewater Storage Tanks:

Pay Attention to the Coating

By CST Industries, Inc.

Today's water and wastewater storage tanks are built for durability. However, a tank's durability and total life cycle often are dependent on the influence of its primary adversary: corrosion. The one thing standing between a storage tank and damaging corrosion is the tank's most valuable feature: its coating.

A storage tank's coating impacts several of its other features, particularly cost, total life cycle, ease of construction, and maintenance requirements. Many companies utilize technologically advanced coatings of glass or epoxy. But not all coatings are equal. The type of coating as well as the application process are what separate the quality of one water and wastewater storage tank (and one manufacturer) from another.

A tank's coating is the only defense it offers to corrosion. Because unwanted corrosion on the tank wall could contaminate your liquid – and vice versa – it is important to select a coating with proven field performance. Depending on the tank's design, the coating application process will take place at the factory or in the field. Not only the coating itself, but the application process whether inside a factory or in the field, will greatly impact the durability and longevity of the coating and the overall performance of the tank. Here's how the coating process works.

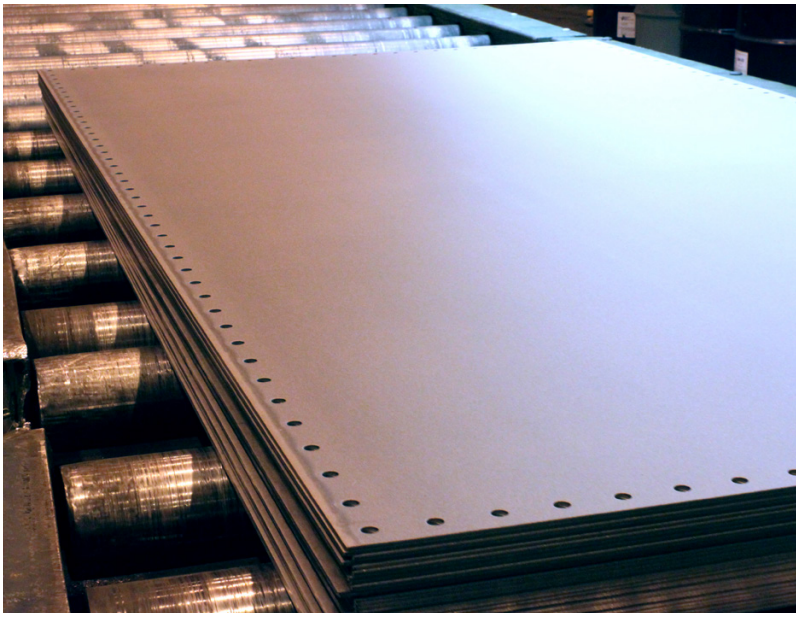
Uncoated steel begins to form a thin layer of corrosion as soon as the raw sheets are formed. Tank manufacturers should remove this layer prior to applying the coating. Some manufacturers utilize chemicals to prepare the surface, which is cost effective, but barely touches the surface. A more vigorous surface preparation, such as blasting with grit, not only removes the surface corrosion but also roughens the steel surface so the coating can better grip, or adhere to, the surface of the steel. A proper sandblast procedure yielding the maximum cleaning and surface profile should meet standards such as NACE No. 2/ SSPC-SP 10 Near White Cleanliness to ensure the coating adheres properly.

Once the surface is prepared, the clock is ticking. The surface becomes vulnerable to environmental contamination. Flash rust can occur quickly in as little as thirty minutes time. This part of the coating process is often underrated, yet critical to avoid compromising the quality of the coating. The length of time between surface preparation and coatings of paint will greatly affect the expected longevity in the field. Some customers will include in specifications a first coating application be no more than 15 minutes after the surface preparation has been completed.

Particles from environmental contamination also will affect surface adhesion of the coating. Quality tank manufacturers employ significant quality control measures, including cleaning and filtering equipment, to remove particulates from the air so they won't interfere with coating adhesion.

Tanks that receive coatings in the field should be inspected to ensure that good surface preparation has occurred on all surfaces, including the underside of the floor, which is not easy to reach, and as well as the underside of roofs, which requires blasting shot upward. Factory coated tanks will undergo surface preparation as part of their application process at the factory. Good surface preparation includes uniform grit blast coverage even in hard to reach spots and achieving a uniform mill profile for maximum coating adhesion.

Factory applied coatings often are tested throughout the process. Incremental tests ensure that no part of the coating process is



Proper panel surface preparation is important for coating adhesion.

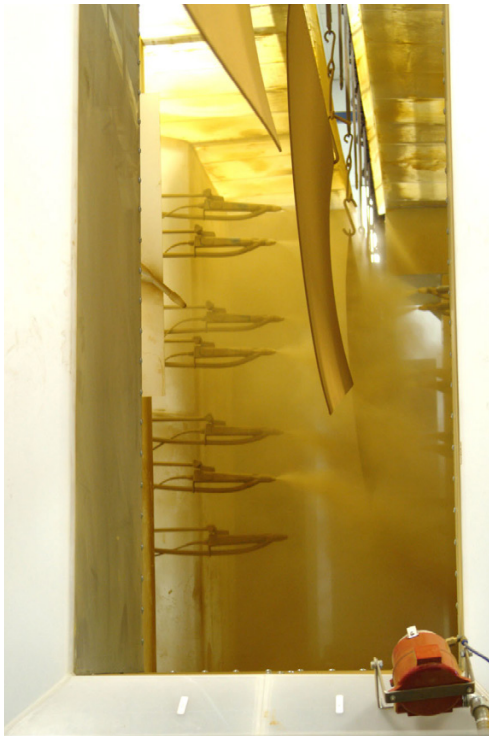
compromised. Wash water temperature and pH, proper grit blast profile, paint booth temperature, humidity, and air quality, are tests a quality manufacturer monitors.

Factory applied coatings are applied to individual tank panels under environmentally controlled conditions. Coatings applied at the factory are closely monitored throughout the process. Two common factory applied coatings include high quality glass-fused-to-steel (porcelain enamel) and powdered epoxy. High-tech coating lines control the coating application process by measuring the quality and thickness of the coating, capturing overspray, monitoring particulates in the air, and testing for uniformity. Glass-fused-to-steel coatings are applied in layers of two to three coats, including a top coat. Powdered epoxy coatings are applied electrostatically to ensure uniform thickness and good adhesion to corners and edges. Some epoxy coated tanks utilize a coat of epoxy paint on the exterior of the tank in lieu of a top coat of acrylic polyurethane. However, acrylic polyurethane offers better UV resistance, which results in less chalking and fading.

In the field, tanks often are sand blasted and coated with epoxy, using a hand-held sprayer. In some areas environmental standards have been put into place requiring the blasting materials, and paint overspray to be captured by tenting to prohibit the release of harmful silica and VOCs into the atmosphere. Field application often includes two coats consisting of primer followed by a top coat such as acrylic polyurethane. It is possible, although difficult, to monitor and control particulates in the air during the coating process. Contamination is a concern, as curing for field applied coatings is subject to local ambient conditions such as air temperature and humidity.

The process of curing the coating varies from tank to tank. Factory applied coatings may either be thermally cured in temperature controlled ovens, or by ambient air, in the case of epoxy coating systems. Glass frit cannot be fused to a substrate in the field, therefore glass-fused-to-steel coatings are only factory applied. Fusing glass to steel requires molecular interaction resulting in a coating which blends glass and steel so that one cannot be separated from the other. In this process glass is fused to the steel surface at 1500°F which forms a tight chemical comingling of materials. Some glass-fused-to-steel tank manufacturers fire the panels after two coats are applied, then follow with a third coat and second firing. The most advanced tank manufacturers utilize technology which allows for three coats successfully fused to the steel during one firing. This reduces the cost and time required for the coating application, as well as the risk of contamination between coats.

Factory applied epoxy coatings sometimes are cured by ambient air; however, a thermal cure is preferred. Thermal curing of occurs when panels pass through curing oven temperatures of 400°F. Epoxy coatings applied and cured under factory controlled conditions are proven to be durable and long-lasting. Beware of tank vendors who claim their epoxy is “fused” to steel, as this is technically impossible.



Powdered epoxy coatings should be electrostatically applied to ensure uniform thickness and good adhesion.

Glass is fused to steel at 1500°F to form a chemical bond.

Field applied coatings most commonly rely on ambient air to cure. This method of curing can require up to 72 hours. The ambient air curing process is subject to weather and environmental conditions, including temperature, humidity, wind and dust.

All tank coatings should be tested for quality assurance. Missed spots often are not detectable by the human eye. Rust and corrosion will start at a pin point sized missed spot – or “holiday” – and spread. While corrosion creep will not occur with glass-fused-to-steel coatings, all coatings – including glass – must be holiday tested for missed spots prior to the first use of the tank.

The basic test for holidays utilizes a 67.5-volt tester. A wet sponge with an electrical charge is moved across the surface. The metal behind the coating also receives a charge. Wherever the wet sponge touches bare metal, a circuit is completed and the holiday is made known by either an audible or visual indicator.

A more stringent test, however, is the high voltage spark detector. This test uses the material's dielectric strength to determine the minimal coating thickness. Both a wand and the tank wall receive a charge. If the electrical current reaches bare metal or detects thinly applied coating, a spark appears showing the exact location. High voltage defect testing proves the uniformity of the coating over all surfaces, including tough to reach areas. Determining thin spots is imperative because thinly applied coating may allow premature corrosion. High voltage defect testing is not common among tank manufacturers, and its use is another way to measure the quality of a tank coating.

For field applied coatings, both tests may be employed. However, a high voltage spark detector test should be requested. During coating application with a hand-held sprayer, it is difficult to ensure uniform application across all surfaces. Without the control measures found within a factory setting, the best scenario includes hiring an independent certified coatings inspector to monitor the coating application process (ensuring proper tenting, surface preparation, checking mill thickness, etc.). Many coatings manufacturers recommend using a NSF-certified inspector. While it may be tempting to inspect coatings yourself, a trained expert will certify that your coating is properly applied, ensuring the longest possible life for your tank.

Your tank is only as strong as its coating. The better the coating application process, the longer the tank will last. While it may be tempting to choose a tank based solely upon up front cost, you should research total life cycle cost of each option. A field applied coating may require repainting sooner than a factory applied coating. Ask vendors to explain their coating process. Ask for data and case histories about how the coating performed over time. Ask about maintenance and recoating requirements. Finally, investigate quality control and testing measures used throughout the process.

While most tank manufacturers claim to utilize the "best" coating, this can only be proven through years of performance. Therefore, audit or visit the factory where your coating will be applied, or visit a site where a tank is receiving a field applied coating, to validate the steps taken during the coating application process and ensure your tank manufacturer will deliver a tank that will provide long-lasting, durable storage.

For more information about tanks and coatings, please visit
www.cstindustries.com

All tank coatings should be tested for quality assurance.

About CST

CST Industries, Inc. has installed more than 350,000 tanks and 18,000 covers in over 125 countries. CST is a dynamic combination of the world's leading factory-coated steel tank and aluminum cover companies, and it is home to world-class brands including Aquastore®, HydroTec® (formerly Columbian TecTank®) and OptiDome®. CST's aluminum domes, flat panel covers and reservoir covers are versatile enough to permit a wide range of accessories important to the water and wastewater industry. They provide the strength, durability, odor control and protection characteristics unavailable in steel, plastic, fabric or any other materials of construction. CST tanks are available in bolted and welded designs, capacities of 4,000 to more than 6 million gallons and in-ground, standpipe or elevated configurations.

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