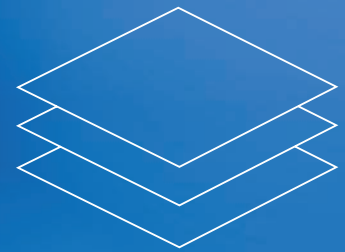


# Trico Bond SD™

## Coatings Competitive Report



Powered by **Valspar Proprietary Technology**

# CST

## ➤ Overview of CST's Coatings Technology and Performance

CST's Trico Bond SD™ severe duty epoxy powder coating for tanks is powered by Valspar's proprietary coating technology Pipeclad®.

Valspar's Pipeclad coatings deliver outstanding performance for the oil and gas industry, protecting hundreds of thousands of miles of pipes and drill pipe across the globe in the most demanding environments. Pipeclad is backed by more than 30 years of proven field experience in the most demanding environments that organic coatings are called upon to withstand:

- Extreme Temperatures, (from -70°C to >200°F)
- High Pressures, (exceeding 70 MPa or 10,000 psi)
- Corrosive Environments, (from water, formulation fluids and aggressive acids, such as hydrogen sulfide and both aqueous and supercritical carbon dioxide)

Based on decades of experience, Valspar has teamed up with CST to provide the technology for a best-in-class coating used on liquid and dry bulk storage tanks for the following markets: Agriculture, BioEnergy, Dry Bulk, Fire Protection, Frac Process, Industrial Liquids, Petrochemical, Power Generation and Potable Water.

What follows is the detailed test data and performance summary of Valspar's proprietary coating from which CST's Trico Bond SD is based. This data is comprised of:

- Lab testing performance of CST's Trico Bond SD coatings vs. competitor's coatings
- Excerpts from Valspar technical paper on epoxy powder coatings used as a protective coating for the oil and gas industry

**valspar**  
if it matters, we're on it.®



# » About Valspar Industrial Coatings

For more than 200 years, Valspar has led the way in developing high-performance coatings for a wide range of industrial applications.

Valspar's global team of technology experts, including chemists, scientists, and engineers, apply their experience to deliver the latest innovations to leading brands around the world.

Today, Valspar serves more than 20 major industrial markets, including: Agricultural Equipment, Construction Equipment, Mining Equipment, Oil & Gas Pipelines, Truck Trailer, Water Pipelines, Water Storage, Bulk Tank Storage, Rebar, Piling, Commercial Vehicle Equipment and Railcars. Whatever the equipment, Valspar coatings provide long-term corrosion protection in the most demanding environments to ensure extended asset life and long-term performance.

The test data is clear: CST's best-in-class Trico Bond SD coating for tanks delivers outstanding performance.

The technology behind the coating is proven: Valspar's Pipeclad coating technology has more than 30 years of performance, protecting hundreds of thousands of miles of pipes and drill pipe across the globe in the most demanding environments. With CST's Trico Bond SD coating, you can be assured of outstanding performance in liquid and dry bulk storage tanks for Agriculture, BioEnergy, Dry Bulk, Fire Protection, Frac Process, Industrial Liquids, Petrochemical, Power Generation and Potable Water.

## About Testing

Coatings are the first line of defense in protecting the integrity of your assets. That is why it is critical that we scientifically understand the long-term performance capabilities of the coating solutions we provide. In order to provide the most genuine and predictive performance data, CST samples are prepared using the exact same protocol as finished tanks. The results that are shared are based on panels that use the same substrate and blast profile as our production lines. This ensures the results truly represent real-world performance and not just an 'ideal' scenario.

### Salt Spray Testing

Salt Spray Testing is an accelerated method of corrosion testing commonly used to compare performance. Salt Spray Testing (ASTM B117) provides great insight into long-term coatings performance by exposing panels to salt water spray at a constant temperature for an extended period of time. Ultimately, this recreates one of the harshest operating environments from which to forecast coating performance over time.

#### What does this mean for you?

This test provides an excellent method for comparing coating options and how they will perform relative to each other.

*Both factory-applied powders did well vs. the best-in-class field applied coating, which blistered at just 4000 hrs. Trico Bond SD maintained complete integrity.*

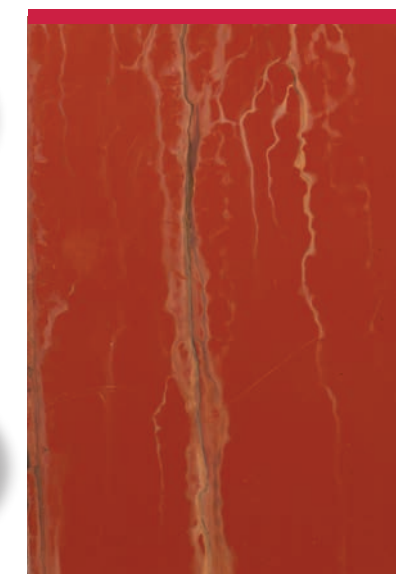
### 6000 Hours Salt Spray Test

Field Applied Liquid  
Industry Assumed Best-In-Class



» Blistering started at 4000 hrs. allowing the corrosion process to begin.

Factory-Applied Powder  
Typical Competitive Bolted  
Coating Alternative



» Coating integrity is still strong with limited weathering observed.

Trico Bond SD  
CST's Severe Duty Epoxy  
Powder Coating



» Retained excellent adhesion, gloss and integrity.

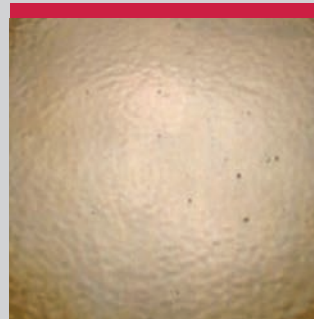
# Testing Continued

*Additional 3rd party testing showed Trico Bond SD outperformed the perceived state-of-the-art coating for tanks in the Alberta Oil Sands.*

## Autoclave Test Results: Trico Bond SD vs. Other Company

6 months of Autoclave Exposure at 210°F in tap water.

Trico Bond SD



Other company



## Immersion Testing

Immersion testing is designed to predict a coatings integrity after exposure to various liquids over time. The solutions are heated to a minimum of 200°F to provide the harshest testing environment. In order to test both hydrophobic and hydrophilic solutions, three separate tests are performed:

### Hot Water Test

Panels are exposed to 200°F water for an extended period of time, testing the long-term integrity under maximum operational design conditions. Over time, coatings exposed to liquid may begin to soften as liquid permeates the surface. This is accelerated with higher temperature (common among many industrial processes). When this happens, blisters can form that causes the coatings to degrade, chip, or lose adhesion, exposing the metal to both the liquid and environmental elements. Immersion testing seeks to identify how well coatings resist softening, permeation, chipping and loss of adhesion after storing liquid.

### Sea Water Test

Panels are exposed to 200°F salt water for an extended period of time, testing resistance to blistering from exposure to coastal or environments with a high dissolved solids contents like frac water, brine, and industrial applications.

### Hot Water Autoclave

Panels are exposed to 210°F water under pressure for an extended period of time to simulate boiling or near boiling conditions.

A third party coatings test was conducted by the SAGD industry in Alberta, Canada to evaluate and compare the coating performance.

### What does this mean for you?

Immersion testing provides a forward look at how you can anticipate a coatings performance over time after storing liquid. The fewer the blisters recorded, the better the long-term performance of the coatings. In addition, since coating performance is greatly impacted by elevated temperature, this testing helps determine how a coating will stand up to routine operation and/or upset conditions; increasing tank life.

## Falling Sand Testing

Over time coating erosion can happen after repeated abrasion from loading and unloading dry goods. The Falling Sand Test mimics the abrasion that can occur by constantly bombarding panels with sand for extended periods of time.

### What does this mean for you?

To protect your asset, you want coatings that show the least amount of erosion and wear. This means longer coating life and less repair work needed over the life of the asset.

*Trico Bond test results show it's more than 2x better than competitor coatings. See chart for results.*

## Immersion Test Results

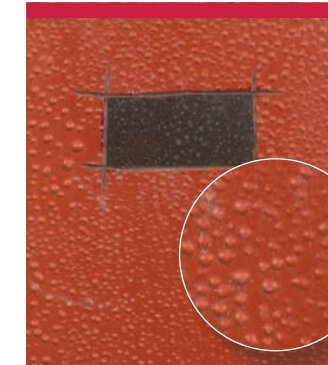
### 6000 Hours Hot Water Immersion Test

Field Applied Liquid  
Industry Assumed Best-In-Class



» Retained adhesion with no blistering, but brittle.

Factory-Applied Powder  
Typical Competitive Bolted Coating Alternative



» Results show complete loss of adhesion with severe blistering.

Trico Bond SD  
CST's Severe Duty Epoxy Powder Coating

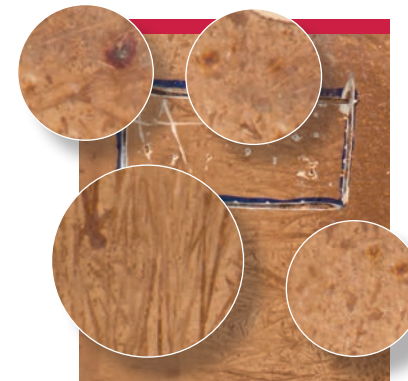


» Retained excellent adhesion and integrity.

*Competitor results reversed on this test. Factory-applied powder performed worse than the field applied liquid. Only Trico Bond SD retained complete integrity.*

### 6000 Hours Sea Water Immersion Test

Field Applied Liquid  
Industry Assumed Best-In-Class



» Excellent adhesion, but blistering started at 4000 hrs. with brittleness beginning at 6000 hrs.

Factory-Applied Powder  
Typical Competitive Bolted Coating Alternative



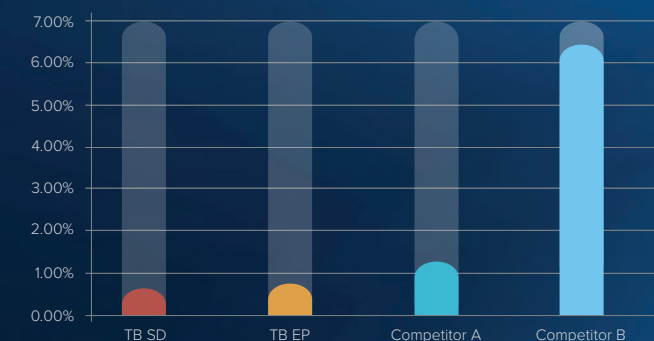
» Results show complete loss of adhesion with severe blistering.

Trico Bond SD  
CST's Severe Duty Epoxy Powder Coating



» Retained excellent adhesion and integrity.

*Both competitor coatings performed poorly with the loss of coating integrity. Trico Bond SD sustained excellent condition.*



## Falling Sand Test Results

Trico Bond test results show it is more than 2x better than the competitions factory-applied bolted powder coatings and more than 12x better than field applied liquid coatings after 50 cycles.

**Falling Sand Test Results Show:**  
Total percent loss after 50 cycles

# OptiBond™ Bolted Epoxy Steel Coating Process

CST's epoxy coated bolted steel storage tanks have been applied to thousands of applications in over 125 countries throughout the world.

CST epoxy coated tanks using the OptiBond process are becoming the standard for epoxy durability, corrosion resistance, UV breakdown, and abrasion. As the world's leader in factory coated tanks, CST understands that the process by which a coating is applied is as important as the coating itself.

Tight manufacturing tolerances and numerous process controls are in place to ensure that the preparation of the steel, application of the epoxy and the curing of the coated material is unmatched. While other companies are making claims about how proprietary the name of their epoxy product is, CST is investing in the entire process.

With 125+ years of experience and over 250,000 field-tested applications around the world, no other manufacturer comes close to our level of knowledge of how to apply epoxy coatings and how they endure in some of the harshest environments. CST is proud to have our potential customers visit our ISO 9001:2015 Certified manufacturing facilities and see first-hand why CST's coating processes are unmatched.

## Benefits of Factory-Applied Coatings

Coatings are applied in an environmentally controlled manufacturing facility and cured at a controlled temperature under strict process controls:

- Eliminates the weather factors incurred when applying a coating in the field after constructing a welded tank. With factory-applied coatings, there is no waiting for the weather to be within specific parameters in order to apply the coatings and trust in the environmental conditions to properly cure the coating.
- Each step in our factory-applied coating process can be carefully monitored so that inconsistencies in the coating can be detected at the earliest possible stage of the process prior to tank construction fully applying the coating.
- Completion of the tank can be performed in as much as 1/3 the time as alternative materials and methods. On-site delays due to weather are greatly eliminated, service can commence earlier and ROI begins sooner.

## The CST OptiBond Coating System

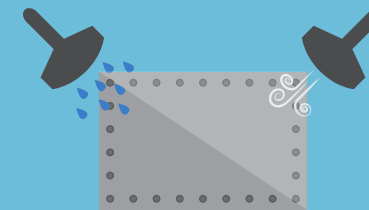
CST utilizes proprietary coating technology that provides maximum corrosion resistance and long tank life. Our experience has led to continuous technology and process improvements. The result is the finest epoxy coating available in the liquid tank industry. The OptiBond coating system is derived from years of in-field experience and performance data.

*Test results show while competitor's liquid and powder coatings did fair or well in some tests, only Trico Bond SD proved to be best-in-class in ALL tests.*

## Coating Process

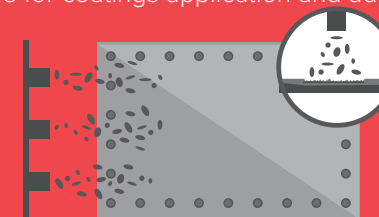
### Step 1: Degrease and Rinse

A combination of rinse solution and hot air is used to clean and preheat the substrate to optimal coating temperature.



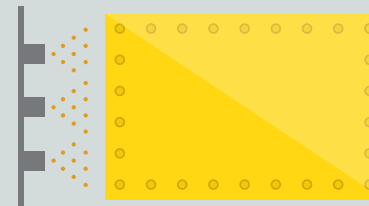
### Step 2: Blasting and Profiling

Engineered grit material is used to blast the substrate and create an ideal 3-D surface profile for coatings application and adhesion.



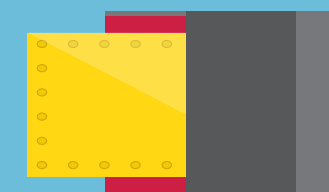
### Step 3: Powder Coating Application

A Valspar powder coating is applied in the proprietary Trico Bond electrostatic booth. Exact controls ensure optimal coatings application.



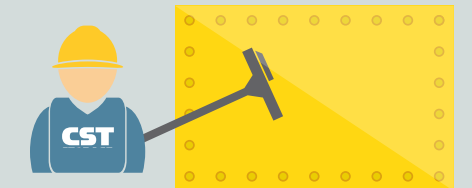
### Step 4: Forced Cure

Parts are cured at a controlled temperature to maximize the cross link bond of the epoxy powder coatings.



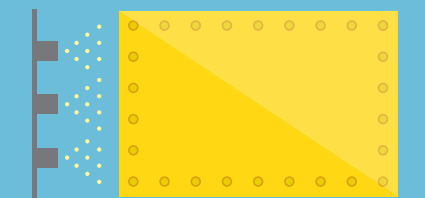
### Step 5: Quality Control Check

Parts are checked using high voltage detectors to identify and correct any holidays, inclusion or thin areas.



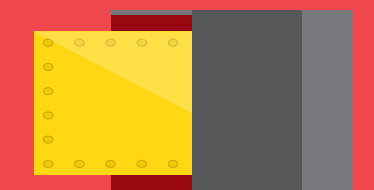
### Step 6: Top Coat Application

Uniquely engineered polyurethane topcoat is applied to increase UV protection on exterior surfaces to extended durability and longevity.



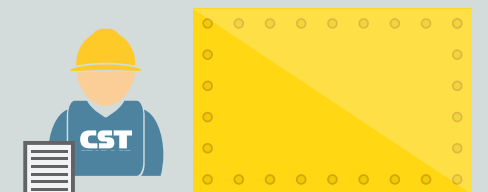
### Step 7: Final Cure

Top coated panels pass through a final oven to cure, yielding an exceptionally durable finished product.



### Step 8: Final Quality Control

Trained service professionals test panels for final Dry Film Thickness to ensure consistent coverage and protection on all panels.



## Trico Bond EP<sup>®</sup> and SD<sup>™</sup> Chemical Resistance

Trico Bond EP - Liquid (max temp 140°F / 60°C) minimum pH of 4		Trico Bond SD - Liquid (max temp 200°F / 93°C) minimum pH of 3	
10% Aluminum Sulfate	Deionized Water	10% Aluminum Sulfate	Deionized Water
32% Ammonium Nitrate	Demineralized Water	32% Ammonium Nitrate	Demineralized Water
30% Ammonium Sulfate	Distilled Water	30% Ammonium Sulfate	Distilled Water
20% Ferric Chloride	Potable Water	20% Ferric Chloride	Potable Water
30% Sodium Chloride	Fresh Water	40% Sodium Hydroxide	Fresh Water
10% Sodium Hydroxide	Municipal Wastewater	15% Urea	Municipal Wastewater
15% Urea	Salt Water	Bleach	Salt Water
Ammonium Hydroxide	Calcium Chloride	Ammonium Hydroxide	Calcium Chloride
#1, 2, 4, 5 & 6 Fuel Oils	Fatty Acids	#1, 2, 4, 5 & 6 Fuel Oils	Fatty Acids
Sweet & Sour Crude Oil	Manure	Sweet & Sour Crude Oil	Manure
Frac / Produced Water	Sewage	Frac / Produced Water	Sewage

Trico Bond EP & SD - Dry				
ABS Pellets	Bone Meal	Flour	Plastics	Sodium Bicarbonate
Ammonium Nitrate	Calcium Carbonate	Frac Sand	Polyethylene Pellets	Soybean Meal
Bauxite	Calcium Chloride	Grain	Polyvinyl Chloride	Starch
Bentonite	Carbon Black	Kaolin Clay	Sand	Terephthalic Acid
Blood (Dried)	Dry Chemicals & Minerals	Perlite	Seeds	Wood Chips

*List of other suitable product applications available. The table above applies to Trico Bond EP and SD coatings. Tank product lines might have other limitations, based upon their configurations.*

### Coating Warranty:

Trico Bond EP: 1 year warranty for most applications.

Trico Bond SD: 5 year warranty available for most applications.

The data listed above on this sheet is provided by CST as a courtesy and represents typical capability. Since applications vary by location, this information should serve as a general guide only. You should always consult your CST sales representative for guidance on the best solution for your situation. In that regard, neither CST or Valspar assumes any obligation or liability for use of this information. UNLESS AGREED OTHERWISE IN WRITING, CST AND VALSPAR MAKE NO WARRANTIES, EXPRESSED OR IMPLIED, AND DISCLAIM ALL IMPLIED WARRANTIES INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR FREEDOM FROM PATENT INFRINGEMENT. CST AND VALSPAR WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. Consult your CST warranty documentation and agreement at time of sales for further information.

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