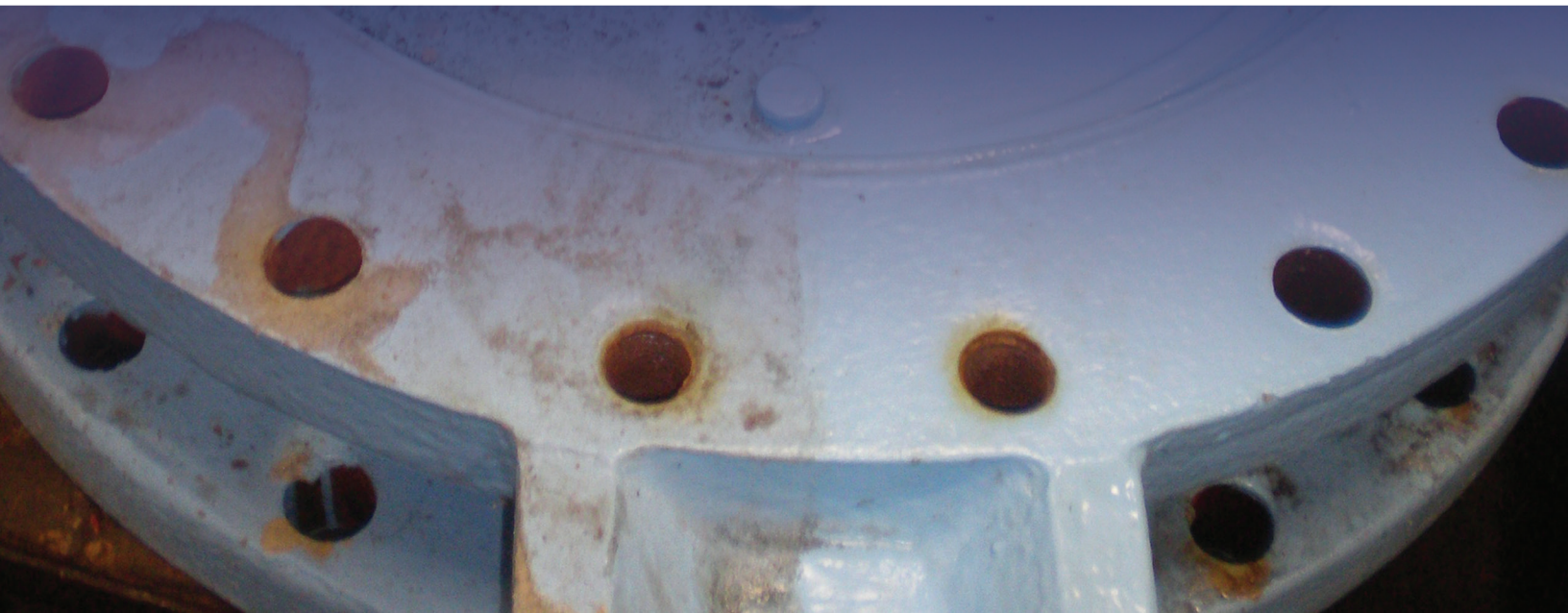
White Paper:
Coating Test Results for Salt Water Valve Applications

PRATT
Henry Pratt Company



A report on a test, its results, and conclusions following the saline spray exposure of a Pratt 24-inch Butterfly Valve coated with PrattGuard 200 on critical surfaces. The valve body and disc, which are of ductile iron construction (ASTM A-536 (65-45-12) had seals added to the valve body and disc shaft bores via additional machining, to prevent intrusion of the flow media into these areas.

Objective:

Rising energy and manufacturing costs coupled with decreasing budgets for existing and new facilities have intensified the need to find lower-cost solutions for the installation and maintenance of valves that can withstand the corrosive effects of seawater or brackish water.

The purpose of this investigative project is to evaluate the performance of an existing and tested industrial coating when applied to valve components that are exposed to salt water. Finding a more cost-effective and efficient alternative is the ultimate goal of this test.

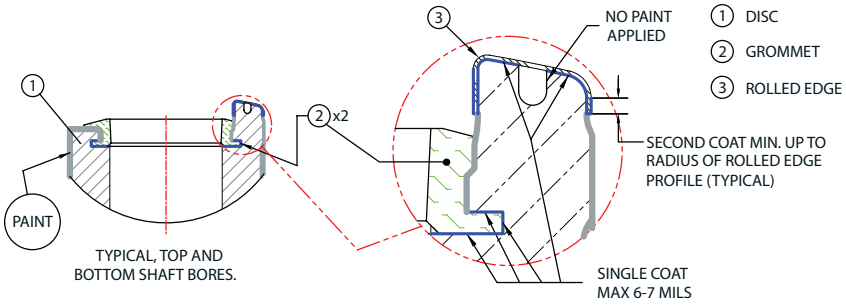
Currently there are two methods for dealing with corrosive effects of seawater. One of the most effective, but also the most costly, is to fabricate a valve entirely of Monel, a specific alloy with high nickel content, or other specialty stainless steel alloys in the manufacture of at risk valves. The second method of protection is to construct the valves utilizing carbon steel or iron materials, and apply rubber linings to the interior wetted parts.

It was proposed that PrattGuard 200, a protective coating offered by Henry Pratt Company, be tested to determine its corrosion resistance when exposed to salt water. If successfully shown to be the equal or superior treatment in comparison to rubber-lined valve interiors, valve manufacturing costs and material costs could be significantly reduced.

Target applications for valves treated with PrattGuard 200 include power generation facilities in coastal regions that often use seawater as a cooling agent, as well as seawater desalinization plants. Valves used in water systems that carry away the corrosive brine from hydraulic fracturing would also be a target application.

Procedure:

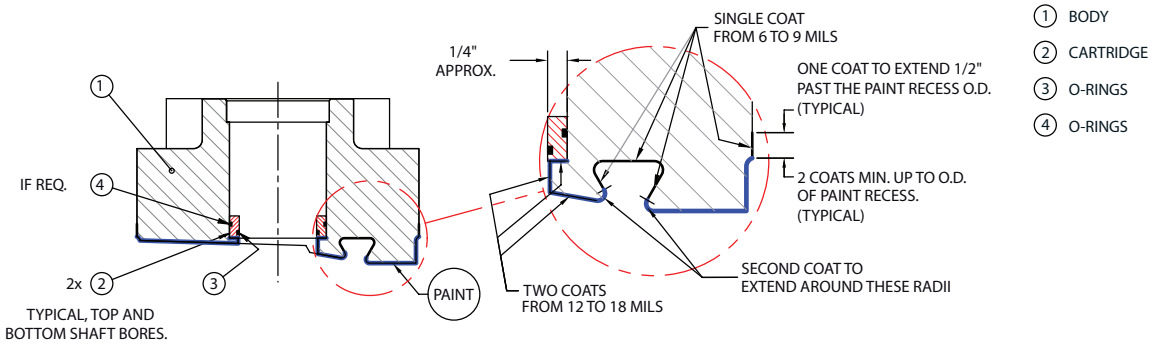
The disc and body of a 24-inch Pratt Butterfly Valve were specially machined to incorporate seals at the shaft bores of the disc and body. The body and disc were then coated with PrattGuard 200 prior to final assembly. All surfaces that could potentially be exposed to salt water were coated. Standard painting processes were followed to provide two coats with each coat being applied using a crisscross multi-pass pattern to deposit 9 mils of thickness. The second application followed the drying of first coat and created the desired total thickness of 18 mils.



The valve was then assembled and sent to the lab to begin testing. To approximate seawater salinity, a 5% salt-water solution was sprayed on the valve four to five times a week for 52 weeks. During this test the valve remained closed and only the flat side of the valve was sprayed, the hub side was never disturbed. The valve was not sprayed on weekends or holidays and the valve was never cleaned during the test.

Results:

The abrasive salt-water solution did not penetrate through the coating, but instead leached on top of the paint from the unprotected area. There were small (1mm to 1.5mm) indications of rust scattered over the entire surface of the valve. The most common area was around the bolt pattern where the bolt holes were not coated or otherwise protected. (Note: This finding is non-critical because the bolt holes are never wetted due to the effective barrier provided by the gasket.)

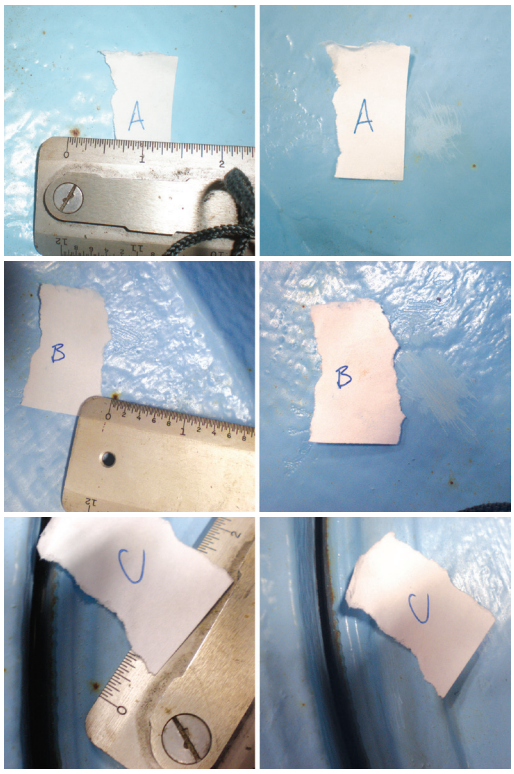


PrattGuard 200 is a cross-linked epoxy-phenolic cured with a polyamine curing agent. 75% solids content, by volume. It's excellent overall chemical resistance to a broad range of damaging acids, alkalies and solvents make it the perfect choice for use in extreme-condition applications.

PrattGuard 200 is flexible and has superior abrasion resistance; 20 milligrams when subjected to Taber CS-17 Wheel with 100 gram weight, and 1000 cycles. It is unaffected by thermal shock after 5 cycles from -70 F to plus 200 F and has a surface hardness 135 seconds (using ASTM method D4366-84, Konig Pendulum standard as compared to the glass Standard of 250 seconds.

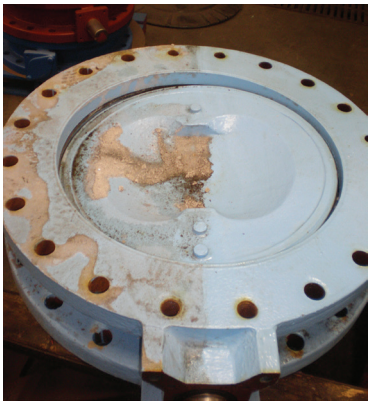
After cleaning the salt residue off the valve, there were visible specs of rust in the concave portion of the disc. We determined this section of the valve would have the most possible damage because after spraying the valve, the water would settle at this section. Three of the largest specks identified as "A", "B", and "C" are pictured on the following page (both before and after cleaning). These rust spots were then carefully cleaned to investigate how deep the rust had penetrated the coating. After cleaning, the spots were deemed superficial because they had not penetrated the protective coating and were caused by airborne iron particles rusting on the surface.

Before cleaning **After cleaning**



Readings of the coating thicknesses in the concave portions of the disc where the salt water had pooled were also taken. No signs of damage were observed and the coat thickness readings were very favorable.

The joints between the disc rolled edge, the disc edge, and the seat groove were considered critical in this test. None sustained any damage, as the PrattGuard 200 coating had not allowed salt water to seep under the rolled edge. The coating successfully protected the edge and did not allow any damage to occur to the seat or valve body.



Conclusion:

After examining and cleaning the test valve surface, it was observed that the salt water had not penetrated the protective coating anywhere on the disc and body. Minor specks of rust were limited to the surface and the coating was easily cleaned using sand paper. Detailed photos of areas “A”, “B”, and “C” demonstrate this lack of rust penetration.

In conclusion, test results demonstrated that PrattGuard 200 and its application methods are a viable alternative to the costly installation of rubber linings and should be utilized based on performance, speed of production, and overall economy.

For additional Information:

Other critical areas, such as shaft bore and disc pins in combination with paint, have also been studied.

If you would like more detailed information, please contact Henry Pratt Company at 630-844-4000.