

Anti-corrosion, anti-oxidation and increased material lifetime

Silcolloy™1000 formerly Silcosteel®-CR

Silcolloy™ improves corrosion resistance of stainless steel by up to 10x!

Economical protection against corrosion

Silcolloy™1000 is highly effective protection for equipment exposed to:

- hydrochloric or nitric
- marine environments

Silcolloy™1000 treatment extends the lifetime of steel and steel alloy systems. High temperature capability and leak-free sealing capability make it an ideal treatment for:

- process tubing, fittings, valves, and reactors
- gas transfer and delivery systems
- nozzles
- stack gas monitors
- analytical testing equipment in harsh environments

Methods available to control industrial corrosion are limited to corrosion-resistant alloys, barrier coatings, cathodic protection, and corrosion inhibitors. When properly applied, each method can be effective in slowing corrosion, but each has limitations as well. For example, some coatings are inexpensive, but require rigorous inspection and/or frequent reapplication. Corrosion-resistant alloys can provide exceptional protection, but can be prohibitively expensive. Some alloys require significant process redesign, increase operating cost, or generate hazardous waste.

Silcolloy™1000 is a proprietary (U.S. Patent #7,070,833), multilayer silicon, chemical vapor-deposited (CVD) coating, specifically designed to improve the corrosion resistance of steel, stainless steel, alloys, glass, and ceramics. The unique non line-of-sight CVD process produces a flexible amorphous silicon layer that diffuses into the metal lattice. The layer will conform to the most intricate surface while maintaining high dimensional tolerances. Silcolloy™1000 will deform with tubing surfaces, allowing leak-free seals or radius bends.

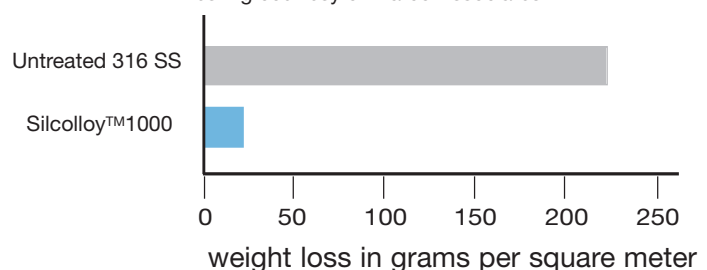
Independent Laboratory Testing

Silcolloy™1000 offers an order of magnitude or more improvement in corrosion resistance relative to existing processes.

Corrosion testing of Silcolloy™1000 treated 316L stainless steel and untreated 316L steel according to ASTM G 48, Method B2 (72-hour ferric chloride pitting and crevice corrosion testing), shows corrosion of the treated stainless steel is reduced by an order of magnitude, as measured by weight loss (Figures 1 and 2).¹

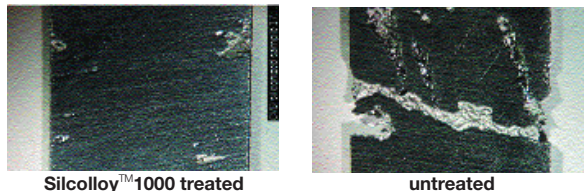


Figure 1 Silcolloy™1000 treated stainless steel outperforms uncoated metal by an order of magnitude (ASTM G 48, Method B). Testing courtesy of Matco Associates.



Testing of Silcolloy™1000 treated coupons in neutral, acidic, and basic chloride solutions, according to ASTM G 61,¹ shows Silcolloy™1000 treatment reduces corrosion rates by an impressive 50x, compared to untreated 316L stainless steel.

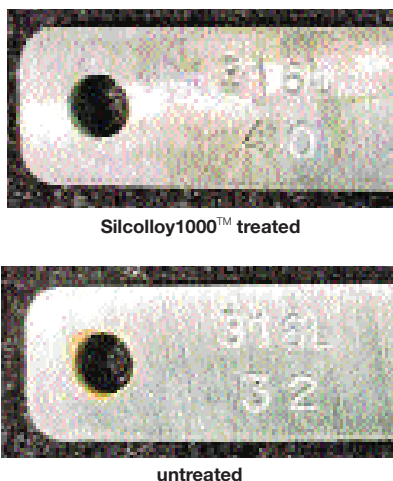
Figure 2 Silcolloy™1000 treated 316L stainless steel coupons show no crevice corrosion and only slight pitting corrosion; untreated coupons exhibit severe crevice corrosion. Testing courtesy of Matco Associates.



Improved Performance in Marine or Acidic Environments

Silcolloy™1000 treatment is effective in acidic or salt corrosive environments, in which the user demands extended service life for an existing process without using high-priced alloys. 4000-hour salt spray testing (salt spray accelerated weathering test ASTM B117) shows Silcolloy™1000 treated stainless steel coupons exhibit no surface corrosion, while untreated coupons show surface corrosion and accelerated corrosion at the coupon hole (Figure 4). Neither coupons developed pitting over the test period.¹

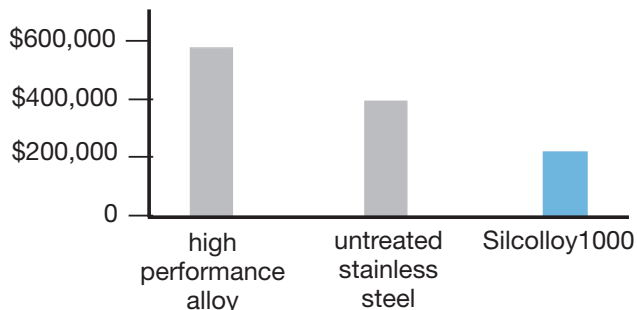
Figure 4 Comparison of estimated lifetime costs in a typical process system, shows Silcolloy™1000 treatment can reduce the overall lifetime cost of the system by hundreds of thousands of dollars.



Save Thousands with Silcolloy!

Estimated lifetime cost savings of a typical process system show Silcolloy™ treated sample lines, fittings and valves will save the user hundreds of thousands of dollars. While the initial cost of an unprotected stainless steel system is lower than a comparable Silcolloy™1000 treated system, the overall lifetime cost, considering replacement cost due to corrosion is nearly double that of a Silcolloy™1000 treated system (see figure 5). Conversely, high performance alloy systems offer superlative corrosion performance, but the initial material cost can be up to six times higher than a comparable stainless steel system.

Figure 5 Silcolloy™1000 demonstrates significant cost savings, compared to untreated stainless steel or alloys (US dollars).



Summary

Silcolloy™1000 treatment has extended the life of process systems in oil and gas production, oil refining, petrochemical processing, aerospace equipment, food and beverage processing, and laboratory testing facilities worldwide.

Test data show that Silcolloy™1000 treatment is effective in extending the corrosion resistance of stainless steel process systems while reducing overall system maintenance cost. Because Silcolloy™1000 treatment can be applied to a majority of existing process components, process equipment life is extended without significant re-engineering.

References

1. M. Zamanzadeh; G. Bayer; G. Rhodes; D. Smith; M. Higgins; Laboratory Corrosion Testing of a Chemical Vapor Deposited Amorphous Silicon Coating; Matco Associates, Inc. Pittsburgh, PA; SilcoTek Corporation, Bellefonte, PA. 2005



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