

Non-stick, Anti-coking,
Anti-fouling, Anti-sludge

SilcoKlean™1000 formerly Silcosteel®-AC

SilcoTek™ surface treatments inhibit catalytic coking and carbon fouling.

SilcoKlean™1000 treatment adds value to your process:

- Inhibits catalytic coking
- Longer component lifetimes
- Decreased maintenance costs
- Higher thermal efficiency
- Will withstand temperatures to 550°C
- Apply to existing equipment



Figure 1 A SilcoKlean™1000-treated piston (left) shows dramatically less coke buildup than an untreated diesel piston (right).
Data courtesy of The Pennsylvania State University.

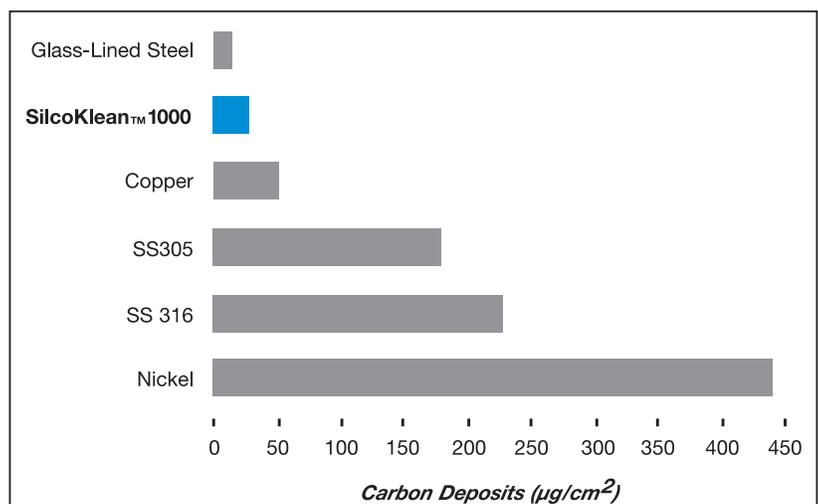
An important contributor to high maintenance costs is a buildup of carbon-based deposits on combustion related components or process systems known as carbon fouling, or coking. Coking has been responsible for engine failures, shortened maintenance cycles, and unplanned repairs. For example, diesel engine manufacturers have determined that coking on pistons is a contributor to shortened engine life and costly rebuilds (Figure 1).¹ Aircraft maintenance personnel are discovering significant coking in fuel lines, oil lines, and nozzles.

Studies have shown that coking occurs when fuels or oils are exposed to temperatures over 200°C, and increases significantly at temperatures over 400°C. Frequently, exposure to high temperature occurs after the engine or process is shut down, when there is no coolant flow to carry away excess heat.²

Reduce coke formation 8-fold with SilcoKlean™1000 surface treatment

SilcoKlean™1000 reduces the formation of coke by preventing exposed metal surfaces from catalyzing fuel into carbon filaments. Figure 2 compares the carbon buildup on various surfaces. SilcoKlean™1000 reduces carbon fouling or coking by 8-fold when compared to an uncoated 316 stainless steel surface.

Figure 2 SilcoKlean™1000 treatment reduces coking up to 8-fold.
Data courtesy of The Pennsylvania State University.

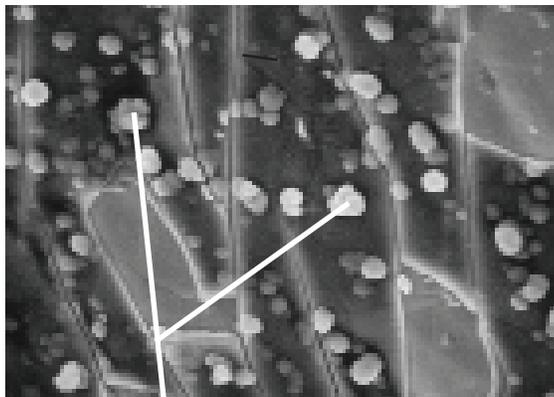


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A SilcoKlean™1000-treated surface not only prevents the formation of filamentous coke, it simplifies removal of other types of coke that typically bind to a heated surface (Figure 3). Studies have shown that carbon deposits can be removed from a SilcoKlean™1000 treated surface simply by sonicating the surface in common solvents, thus dramatically simplifying maintenance procedures and extending maintenance cycles.³

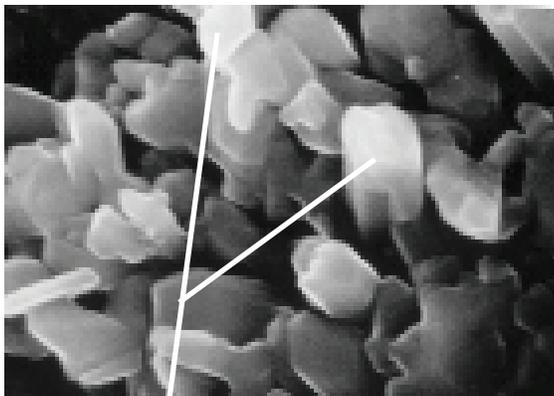
Figure 3 Carbon deposit from JP-8 fuel on various types of tubing (500°C, 500psi, 1cc/min. flow rate). Data courtesy of The Pennsylvania State University.

SilcoKlean™1000



Carbon nucleation lands on surface but can easily be removed from a SilcoKlean™1000 surface.

304 Stainless Steel



Untreated stainless steel promotes carbon filament growth that cannot be removed with sonication.

Apply SilcoKlean™1000 treatment to components susceptible to coking

SilcoKlean™1000 is a chemical vapor-deposited (CVD) layer, designed specifically to reduce coking of steel, stainless steel, and specialty alloys. The unique non-line-of-sight CVD process produces a flexible, amorphous silicon layer that diffuses into the metal lattice and conforms to the most intricate surface, while maintaining high dimensional tolerances. SilcoKlean™1000 layer will flex with the metal surface, and form leak-free seals, even at the most demanding temperatures.

SilcoKlean™1000 treatment extends maintenance cycles for engines while maintaining high dimensional tolerances, high temperature capability, and leak-free conditions, making it an ideal treatment for:

- fuel injection nozzles
- fuel and oil lines
- jet engine nozzles
- pistons
- EGR systems
- valves
- turbine shafts
- heat exchangers

In Summary

Test data show that SilcoKlean™1000 treatment is highly effective in reducing catalytic coking, by as much as a factor of 8. Because SilcoKlean™1000 treatment can be applied to existing components, maintenance cycles can be extended without significant re-engineering. SilcoKlean™1000 treatment is a proprietary (U.S. patent 6,444,326), custom service, offered by SilcoTek™.

To learn more about how SilcoKlean™1000 treatment can reduce coking in your process or engine fleet, visit SilcoTek on the web at www.SilcoTek.com or contact our technical service group at 814-353-1778.

References

1. Perez, J., A. Boehman, Penn State Multi-Discipline Tribology Group and Energy Institute Studies The Pennsylvania State University, University Park, PA (1998).
2. Jones, E.G., W. Balster, W. Rubey, Fouling of Stainless Steel and Silcosteel Surfaces During Aviation-Fuel Autoxidation Systems Research Laboratories, Inc, Dayton, OH; University of Dayton Research Institute, Dayton, OH (1995).
3. Altin, O., S. Eser, Analysis of Solid Deposits from Thermal Stressing of a JP-8 Fuel on Different Surfaces in a Flow Reactor Ind. Eng. Chem. Res, 40: 596-603 (2001).

