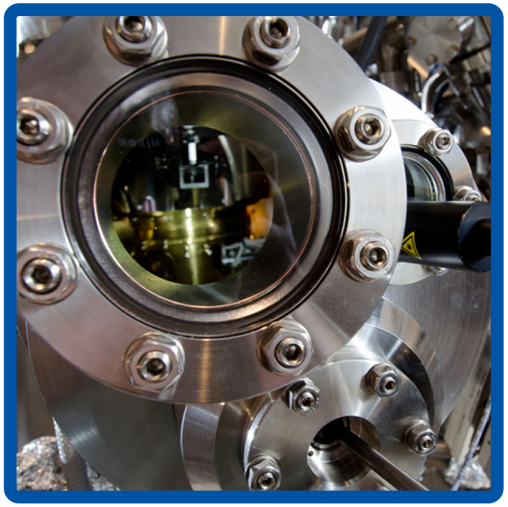
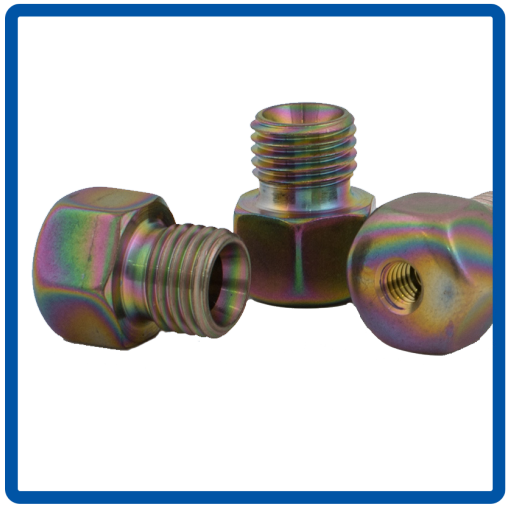


SilcoTek® 101

A comprehensive overview of SilcoTek® Corporation, our game-changing coating technologies, and the critical problems they solve.



History of SilcoTek®

1985 Paul Silvis opens Restek®, a chromatography company, in one room of an elementary school-turned-business incubator.

1987 Restek® invents the original SilcoSteel® coating technology as a way to make metal surfaces act like glass in analytical instruments.

1993 The Restek® coatings group develops a method for treating other analytical components like valves, fittings, and more.

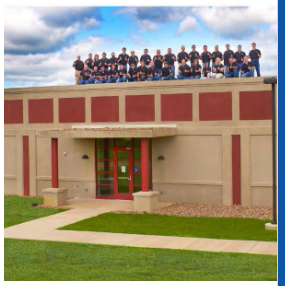
1998 Restek® is awarded the first of several patents for their surface treatments.

1999 SilcoSteel®-treated air monitoring instrument components are installed in the Discovery space shuttle.

2002 The coatings group at Restek® officially becomes its own business unit, expanding into a new coatings facility within the existing building.

2003 SilcoKlean® and Silcolloy® coatings are developed to address customer needs in new, non-chromatography applications.

2009 Restek® sells the company to its employees via ESOP exchange. A core team of 14 Restek® Performance Employees spin off to form SilcoTek®, an independent company dedicated soley to coatings for several industrial markets.



2013 SilcoTek® completes construction of a new ultra-modern coatings facility, more than tripling previous coating capacity.

2018 SilcoTek® passes a milestone of 50 employees and begins to break ground on an addition to their coating facility.

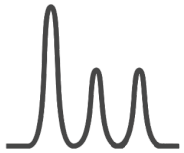
SilcoTek® is the world's leading provider of high performance coatings applied by chemical vapor deposition, or CVD. We became a coatings company because we have a passion for helping people and businesses conquer their most difficult challenges. By improving the surface properties of the materials they use, our customers can run their machines longer, manufacture complex products more efficiently, and continue to develop innovations that push the scientific and industrial world forward. We don't sell any products because we're solely focused on seeing how far our coating technology and service can make our customers go.

As a truly service-oriented organization, we emphasize Plus 1 customer service and employee satisfaction first. Plus 1 means that every SilcoTek® employee strives to exceed your expectations, whether you're asking technical questions, placing an order, or troubleshooting. Equally important, we maintain a workplace culture where our employees enjoy coming to work as much as they enjoy going home at the end of the day.

We serve thousands of customers from several unique industries that have a major impact on the world today, including:


Oil & gas exploration and production

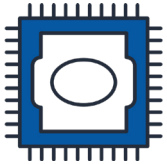

Automotive

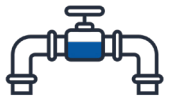

Process Analytical


Chemical manufacturing


Gas & liquid chromatography


Aerospace


Semiconductor manufacturing


Refining


Bio, pharma, and clinical diagnotics

Our unique CVD coating technology was invented in 1987 at Restek® as a way to make metal chromatography columns, used for sensitive chemical analysis, inert (non-reactive) like glass. Fast forward to 2009: Restek's® coating division spins off to form SilcoTek®, an independent company solely dedicated to providing our groundbreaking coatings that solve real-world problems.

This e-book will give you a close look at our history, technology, and impact on our world.

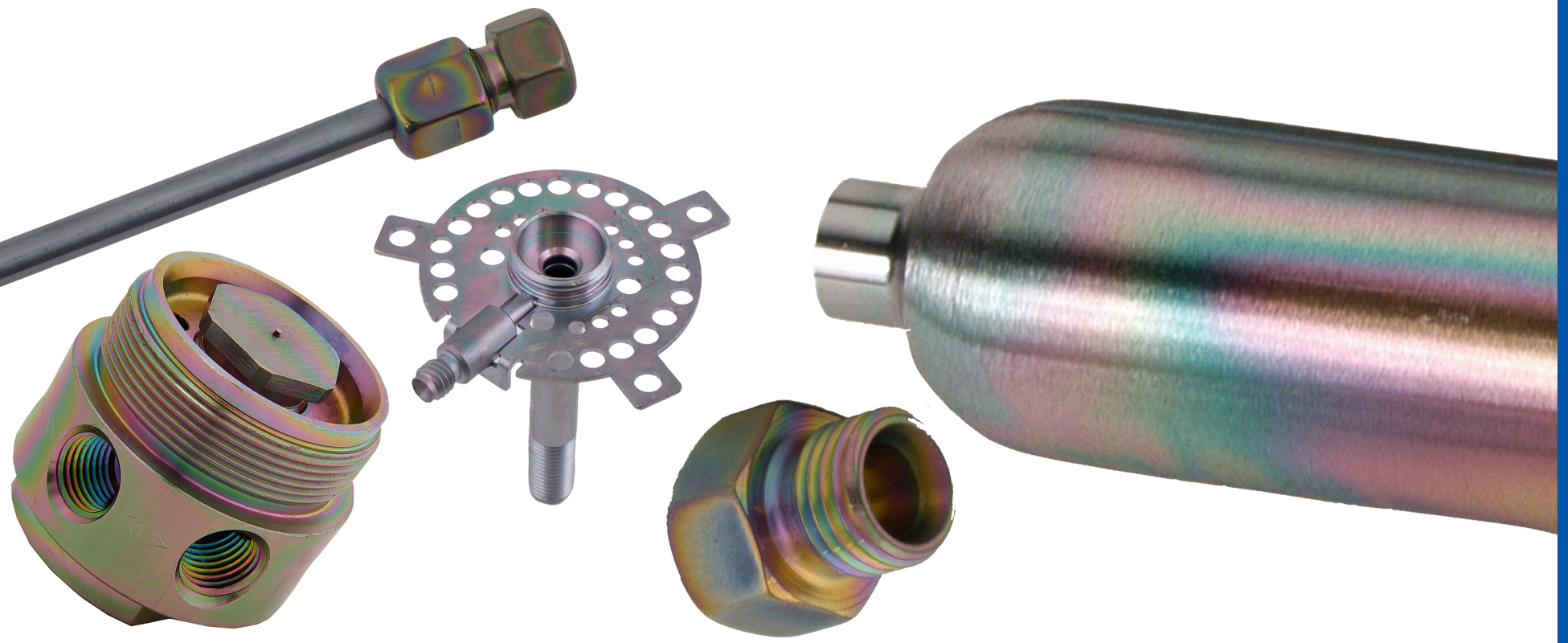
Please contact our team at TechService@SilcoTek.com or by calling +1 (814) 353-1778.

Mission: To create game-changing coatings.

Vision: To change the world with CVD coatings.

Strategic Objectives:

- Providing a world class customer experience
- Intellectual property development and licensing
- Coating capabilities worldwide
- On-site system installation
- Technology leadership
- Employee well-being



SilcoTek Values

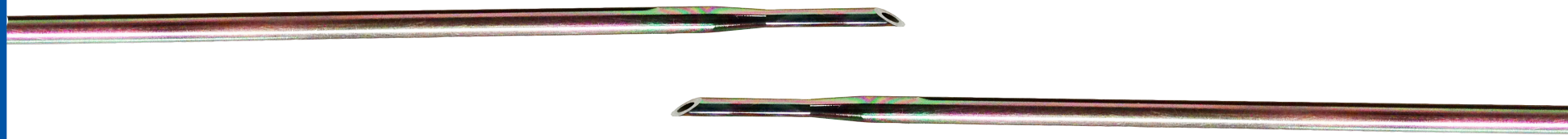
Better Coating Technology

Our chemical vapor deposition (CVD) coating process provides several unique advantages over other surface treatments. Instead of spraying, dipping, or painting, SilcoTek® coatings are formed by introducing a proprietary blend of gases at high temperature into a sealed chamber containing your parts. The gases eventually react and decompose into amorphous silicon (Si) that grows homogeneously across the surface. Because the gas fills 100% of the chamber with your parts inside, even the narrowest and most challenging pathways and geometries are uniformly coated without compromising tolerances or mechanical integrity.

The real value of our technology lies on the surface. SilcoTek® coatings are some of the most robust and versatile solutions available to improve material performance in several demanding industries.

Whether the problem is corrosion, chemical compatibility, moisture, oxidation, coking, catalysis, oil, or something completely unique, our surface technology and R&D experts will work with you to develop a tailored solution that increases your up-time and lowers maintenance costs.

We also offer a broad technology portfolio available for license and a world-class engineering team that can provide all the resources your company needs to produce our coatings at your facility for ultimate supply chain control.



Better Process

You likely haven't experienced a buying process like ours. You can request a quote online or by emailing TechService@SilcoTek.com prompting one of our technical representatives to evaluate your information along with any drawings, photographs, or special requirements you provide. While we guarantee a response within one business day, don't be surprised if you receive a quote within one hour.

SilcoTek's process flow was designed to make part traceability, efficiency, and coating quality paramount. Our ISO 9001:2015 certified process begins with technicians photographing all received parts and verifying their quantities to your order. If a technician notices any discrepancies, damage, or other red flags, our team will reach out to you to discuss how to proceed. Once everything is ready to enter the process, a unique routing is created for your components to ensure they receive all of the appropriate steps required for the best coating results.

Our deposition ovens are programmable logic-controlled (PLC) and automated to produce consistent results from run to run. After being coated, quality control technicians rigorously inspect the parts visually and verify that all process parameters were met.

Better Service

The SilcoTek core values and mission are the foundation of our work. Our "**ZIP Code**" defines the way we operate each and everyday.

Zero customer disappointments
Integrity in all we do
Plus 1 customer service

Our entire process — from answering your initial questions to delivering the final coated product — involves a partnership where our experts work with you every step of the way. You will see SilcoTek's core values (**FISHING**) at work when you partner with us to solve the toughest material challenges in your application:

Fast failure - not slow and stupid
In the light - we don't hide anything, even our mistakes
Servant leadership - management's #1 goal is to make every employee successful
Honesty - trust is our one priority with customers
Innovation - how we continue to deliver game-changing solutions for our customers
Never stop learning - every employee strives to learn something new annually
Give it all you got - the root of our success

CVD Coating Process

1. Visit SilcoTek.com, email TechService@SilcoTek.com, call (814) 353-1778 to request a quote.

2. The SilcoTek team will review your part drawings and send you a quote and shipping instructions.

3. Using the shipping instructions, send your parts to the SilcoTek coating facility.

10. Your coated parts are removed from the oven and given a thorough post-coating cleaning.

11. Your parts are moved to the final quality inspection. They are glove-handled and photographed again.

12. The SilcoTek team packages your parts and sends them back to you. You'll recieve a confirmation email.

CVD Coating Process

4

Lead time begins when your parts arive. Expect your parts back in 10 - 15 business days.

5

Once they arrive, our team inspects your parts for damage.

6

Your parts are photographed for verification and we'll send an order acknowledgement email.

7

Your parts are moved to surface preparation. Contamination is removed, even finger prints.

8

Your parts are visually inspected before coating to ensure a high quality finished product.

9

After carefully loading your parts into a vessel and CVD oven, the coating is deposited.

Watch the SilcoTek Coating Process Overview Video

SilcoNert® 1000

SilcoNert 1000 is a layer of amorphous silicon.

SilcoNert® 1000 (formerly known as Silcosteel®) is a chemically protective barrier of amorphous silicon that is excellent for general purpose barrier applications. Applied via chemical vapor deposition (CVD), SilcoNert® 1000 is ideal for any flow path or other application where preventing a reaction between substrate and process gas, fluids, or other media is necessary.

SilcoNert® 2000

SilcoNert 2000 is a functionalized layer of amorphous silicon.

SilcoNert® 2000 (formerly known as Siltek® and Sulfinert®) is a chemically protective barrier of amorphous silicon that is further functionalized to provide the most inert surface available. SilcoNert® 2000 is a required surface treatment when analyzing trace levels (at parts-per-million and below) of compounds, especially highly active species like H_2S, mercaptans, NO_x, SO_x, mercury, and more.

Silcolloy®

Silcolloy coatings are a multi-layered amorphous silicon coating with no added functionalization.

Silcolloy coatings offer the highest temperature stability of all SilcoTek® solutions while simultaneously preventing corrosion and contamination from metal, glass, and ceramic substrates. These coatings are made up of several layers of high-purity silicon (Si), the same material used to make semiconductors, which provides a dense film that effectively shields coated parts from their process environment. Silcolloy is widely used as a solution to improve the chemical compatibility of various materials and help stainless steel perform like corrosion resistant superalloys, creating significant cost savings for customers in semiconductor, laboratory, energy, and many other industries.

Dursan® NSF

Dursan is a functionalized layer of amorphous silicon, oxygen, and carbon.

Dursan® is our most versatile coating, offering corrosion resistance, chemical inertness, hydrophobicity, slip, non-stick properties and more. Dursan® is NSF certified and FDA compliant. This coating is the best choice for the harshest and most challenging applications. Dursan®-coated stainless steel can perform similarly to exotic alloys at a fraction of the price in several common applications.

SilcoKlean®

SilcoKlean is a specially functionalized amorphous silicon coating.

SilcoKlean® is a coating used specifically for mitigating carbon fouling or “coking” onto metal surfaces in high heat and combustion applications. This coating will improve process efficiency by preventing carbon from building up onto surfaces.

SilcoGuard®

SilcoGuard is a multi-layered amorphous silicon coating.

SilcoGuard® is designed to minimize outgassing in ultra-high vacuum (UHV) systems where rapid pumpdown rates and efficient evacuations are crucial. This coating will aid in maintaining a high vacuum environment with little to no pre-treatment or bake-out. SilcoGuard® is also frequently used in a mass spectrometer (MS) system as a barrier coating.

Dursox®

Dursox is a layer of amorphous silicon and oxygen.

Dursox® is a thin but durable silicon oxide (SiO) high purity barrier coating that prevents semiconductor tool corrosion and erosion. Our patented CVD process bonds super high purity silicon to stainless steel, alloy, glass, and ceramic surfaces. The micro-thin coating penetrates small holes, inner cavities, and narrow bore tubes without significant change in component tolerance. Dursox® will deform with part surfaces, allowing a leak-free seal or radius bend while maintaining high dimensional tolerance.

Siltride®

Siltride is a layer of hydrogenated amorphous silicon oxynitride.

Siltride® coatings are comprised of amorphous silicon oxynitride (a-SiOXNY:H), a robust chemistry that substantially improves corrosion resistance, hardness, wear resistance, and electrical resistivity. As SilcoTek’s most hydrophilic or “water-attracting” coating, Siltride 1000 boasts a water contact angle as low as 10°, making it ideal for improving the surface properties of critical process flow paths in medical devices, life sciences instrumentation, and oil and gas facilities. Siltride coatings are SilcoTek’s best solution for the most demanding applications.

How to use the SilcoTek Coatings Comparison Guide.

Ask the following questions regarding the intended application:

1. What surface properties are required?
2. What is the maximum application temperature?
3. What is the allowable pH range for the application?

Using this information, sum the given values for the properties to find the most effective coating for the application. Here is an example:

1. The application requires surface properties of Chemical Inertness, Hydrophobicity, and Acid Corrosion Resistance.
2. The application is prone to acid corrosion and needs an allowable pH range up to 14.

Using this information, each coating would receive the following scores.

SilcoNert 1000:	(Chemical Inertness, 2) (Hydrophobicity, 2) (Acid Corrosion Resistance, 2) = 6
SilcoNert 2000:	(Chemical Inertness, 4) (Hydrophobicity, 3) (Acid Corrosion Resistance, 2) = 9
SilcoGuard:	(Chemical Inertness, 2) (Hydrophobicity, 2) (Acid Corrosion Resistance, 3) = 7
SilcoKlean:	(Chemical Inertness, 2) (Hydrophobicity, 3) (Acid Corrosion Resistance, 2) = 7
Silcolloy:	(Chemical Inertness, 2) (Hydrophobicity, 2) (Acid Corrosion Resistance, 4) = 8
Dursan:	(Chemical Inertness, 3) (Hydrophobicity, 3) (Acid Corrosion Resistance, 4) = 10
Dursox:	(Chemical Inertness, 2) (Hydrophobicity, 1) (Acid Corrosion Resistance, 4) = 7

According to the sums, Dursan is the best option and SilcoNert 2000 is the second best option. Because the application indicated a need for acid corrosion resistance and a wide pH range, **Dursan is the best choice for this application.**

SilcoTek® Coatings Comparison Guide

This chart scores SilcoTek coatings' properties in relation to each other, not alternative materials. To aid in choosing the best coating for your application, select the required properties from the left column and sum their scores for each coating you're considering. Generally, the coating with the highest total score should be an appropriate choice, but contact us at TechService@SilcoTek.com or 814-353-1778 if you are unsure.

1- Poor 2 - Fair 3 - Good 4 - Excellent

SilcoTek Coating	SilcoNert® 1000	SilcoNert® 2000	SilcoGuard®	SilcoKlean®	Silcolloy®	Dursan®	Dursox®	Notak™
Acid Corrosion Resistance	2	2	3	2	4	4	4	*Coming soon*
Base Corrosion Resistance	1	1	1	1	1	4	4	*Coming soon*
Hydrophobicity	2	3	2	3	2	3	1	4
Hydrophilicity	1	1	1	1	1	1	4	1
Oleophobicity	1	1	1	1	1	1	1	3
Non-stick/ Release	2	2	2	2	2	3	3	4
Chemical Inertness	2	4	2	2	2	3	2	*Coming soon*
Maximum Application Temp.	1410° C	400° C	1410° C	400° C	1410° C	450° C	1250° C	350° C
Allowable pH Range	0 - 8	0 - 8	0 - 8	0 - 8	0 - 8	0 - 14	0 - 14	*Coming soon*
Allowable Analysis Levels	ppm	ppb	NA	NA	ppm	ppm	NA	NA
Typical Thickness	100 - 500 nm	100 - 500 nm	180 - 600 nm	100 - 500 nm	180 - 800 nm	400 - 1600 nm	400 - 1600 nm	*Coming soon*
Material Composition	Amorphous silicon	Amorphous silicon + functionalization	Multi-layered amorphous silicon	Amorphous silicon + functionalization	Multi-layered amorphous silicon	Amorphous silicon oxide + functionalization	Amorphous silicon oxide	Non-polymeric fluoro-organic
Common Applications	Analytical, Chemical Processing, Stack & Flare, Oil & Gas	Analytical, Chemical Processing, Stack & Flare, Oil & Gas	Semiconductor, Research & Analytical, Vacuum Processing	Automotive, Aerospace, Stack & Flare, Refining	Semiconductor, Stack & Flare, Chemical Processing, Oil & Gas	Corrosion, Pharmaceutical, Analytical, Chemical Processing, Oil & Gas	Corrosion, Research, Semiconductor	Mold Release, Heat Exchangers, Life Sciences

Industries and Applications

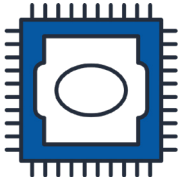
Chromatography and Analytical Chemistry

Benefits:

- Faster instrument response
- Increased accuracy with active compounds
- Improved sensitivity and resolution
- Reduced testing costs

Applications

- *Gas Chromatography*
  - Liners
  - Columns
  - Detector components
  - Ampules and needles
  - Transfer tubing
  - Fittings, valves, and flow control
- *High Performance Liquid Chromatography (HPLC)*
  - Pumps
  - Columns
  - Frits and filters
  - Needles



Semiconductor Manufacturing

Benefits:

- Increased tool lifetime in corrosive gas exposure
- Better purity due to reduced metal ion contamination
- Less downtime from maintenance and replacement
- Excellent adhesion, reduced particulate back-streaming

Applications

- Etch
- Deposition
- Gas delivery
- Exhaust

Oil and Gas Exploration

Benefits:

- Improved sampling accuracy with sulfur and mercury compounds
- Increased sample storage time
- More reliable test results
- Better corrosion resistant

Applications:

- Upstream; downhole sampling bottles and tooling
- Midstream; pipeline
- Downstream; testing, quality assurance, and regulatory

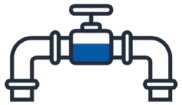
Medical Device and Diagnostics

Benefits

- Better non-stick performance with proteins and other challenging media
- Improved corrosion resistance
- Increased diagnostic accuracy
- Higher lubricity

Applications

- Probes and needles
- Sample transfer tubing
- Mandrels
- Cannulas
- Surgical tools



Process, Refinery and Petrochemical

Benefits:

- Faster response from process instrumentation
- Improved analytical accuracy
- Ensured regulatory compliance
- Reduced testing costs

Applications

- Fenceline/environmental monitoring
- Process sampling
- Stack and flare
- Production equipment

Offshore and Marine

Benefits:

- Increased resistance to sea water/salt spray corrosion
- Improved response from analyzers
- Cost-effective replacement to super alloys in many applications

Applications:

- Filters
- Regulators and mass flow
- Stack probes and tubing
- Splash zone components
- Valves and fittings
- Pump components

Space Exploration

Benefits:

- Increased chemical inertness in extreme conditions
- Improved purity
- Minimized loss of samples
- Improved barrier of properties

Applications

- Thrusters
- Analytical instrumentation and consumables
- Heat exchangers

Aerospace and Automotive

Benefits:

- Increased fuel efficiency by preventing coking
- Improved combustion system performance
- Longer service intervals
- Lower costs from less maintenance

Applications:

- Lubrication and fuel lines
- Nozzles
- Injectors and fuel delivery systems
- Turbochargers and intercoolers

Other common applications for SilcoTek coatings include:

- Molding and packaging
- Food and beverage processing
- Heat exchangers
- Miscellaneous research

With the help of our customers, we discover new applications for SilcoTek coatings everyday. Contact one of our experts to determine if we have a solution for you.

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Coating Use
All statements, technical information and recommendation contained in this document are based upon tests or experience that SilcoTek believes are reliable. However, many factors beyond SilcoTek's control can affect the use and performance of a SilcoTek coating in a particular application, including the conditions under which the product is used and the time and environmental conditions in which the product is expected to perform. Since these factors are uniquely within the user's knowledge and control, it is essential that the user evaluate the SilcoTek coating to determine whether it is fit for a particular purpose and suitable for the user's method of application.

Limited Liability
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