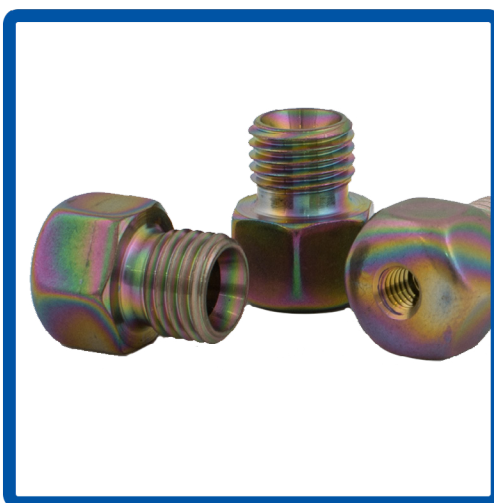


A comprehensive overview of SilcoTek® Corporation, our game-changing coating technologies, and the critical problems they solve.







**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.

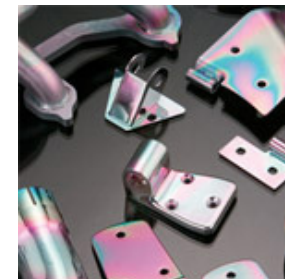
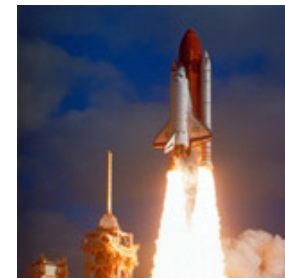
**2002** The coatings group at Restek® officially becomes its own business unit, expanding into a new coatings facility within the existing building.

**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 solely to coatings for several industrial markets.

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

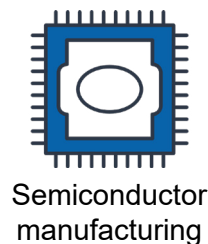
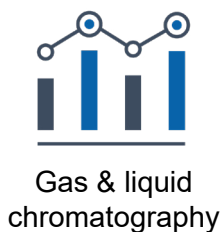
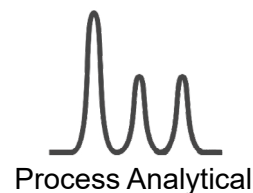
**2018** SilcoTek® passes a milestone of 50 employees and begins to break ground on an addition to their coating facility.



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:



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 [SilcoD@SilcoTek.com](mailto:SilcoD@SilcoTek.com) or by calling +1 (814) 353-1778.**

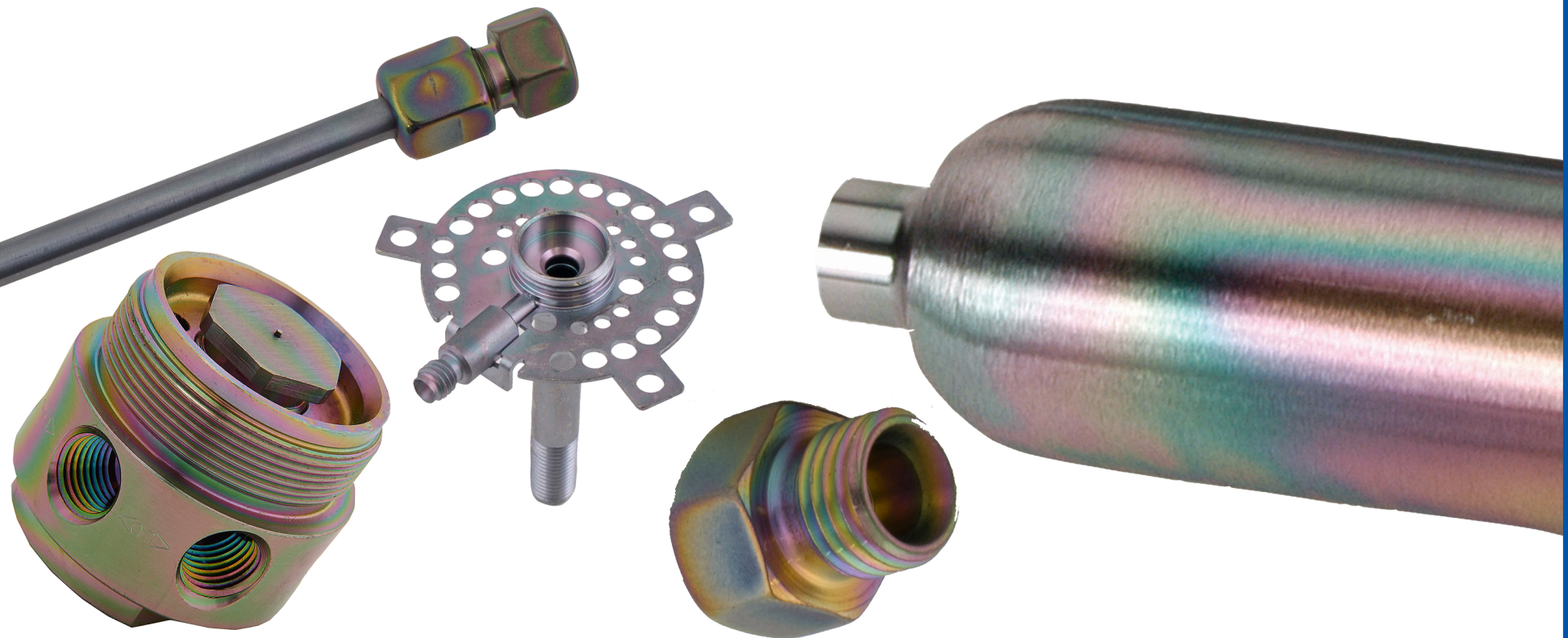


**Mission:** To create game-changing coatings.

**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



### **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 [SilcoD@SilcoTek.com](mailto:SilcoD@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.

**Z**ero customer disappointments

**I**ntegrity in all we do

**P**lus 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:

**F**ast failure - not slow and stupid

**I**n the light - we don’t hide anything, even our mistakes

**S**ervant leadership - management’s #1 goal is to make every employee successful

**H**onesty - trust is our one priority with customers

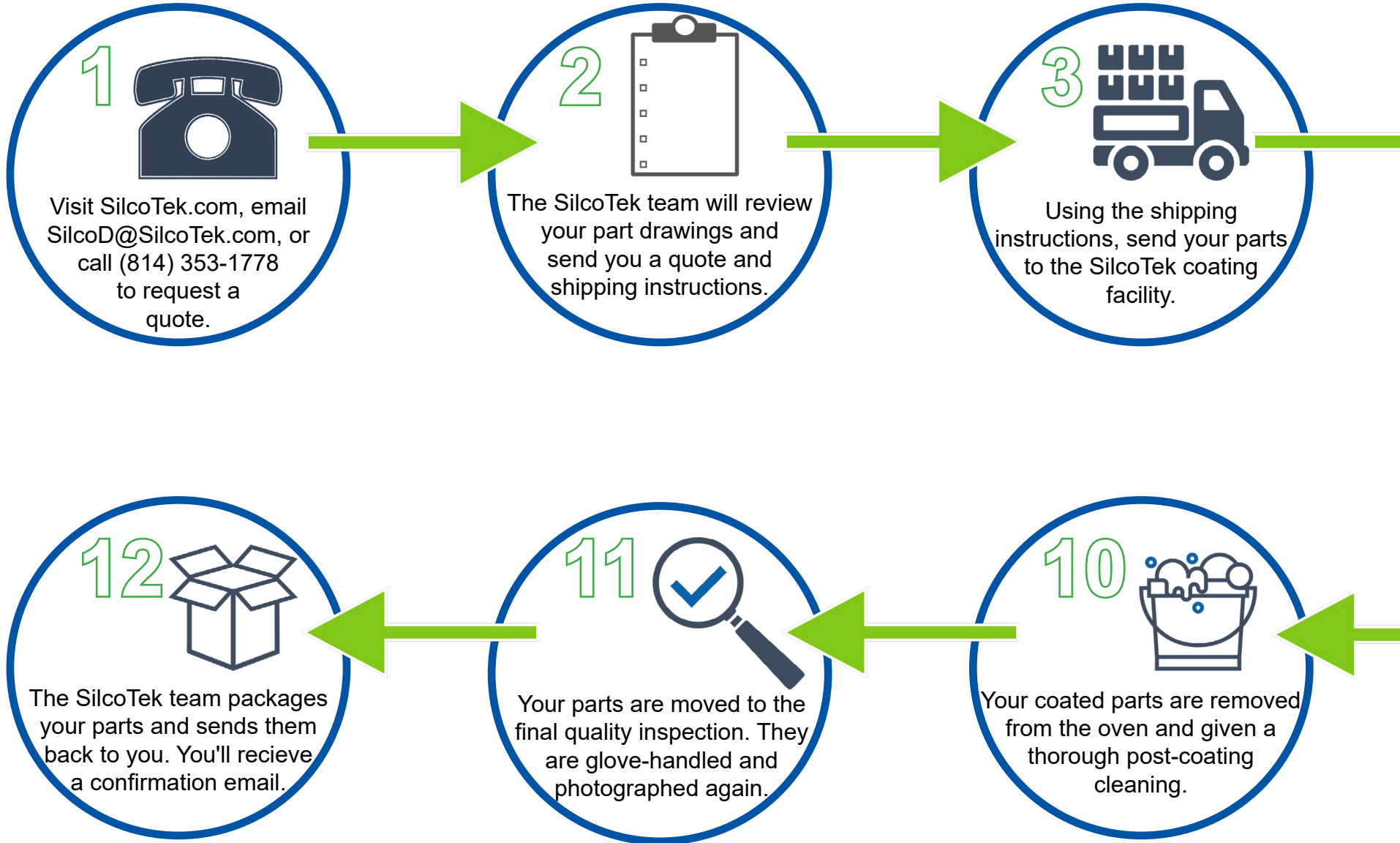
**I**nnovation - how we continue to deliver game-changing solutions for our customers

**N**ever stop learning - every employee strives to learn something new annually

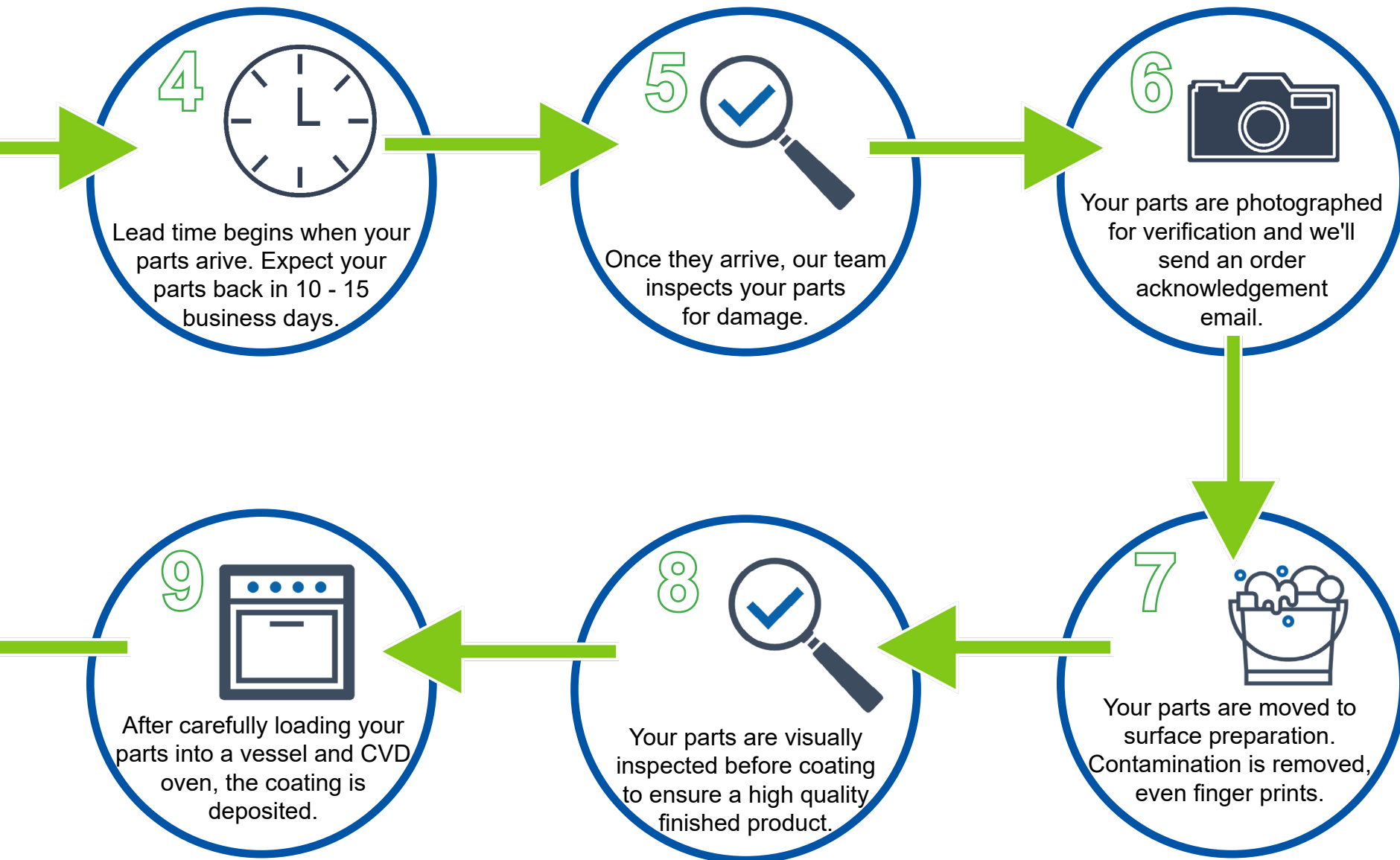
**G**ive it all you got - the root of our success



# CVD Coating Process







[Watch the SilcoTek Coating Process Overview Video](#)

# SilcoNert<sup>®</sup> 1000

**SilcoNert 1000 is a layer of amorphous silicon.**

SilcoNert<sup>®</sup> 1000 (formerly known as Silcosteel<sup>®</sup>) is a chemically protective barrier of amorphous silicon that is excellent for general purpose barrier applications. Applied via chemical vapor deposition (CVD), SilcoNert<sup>®</sup> 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<sup>®</sup> 2000

**SilcoNert 2000 is a functionalized layer of amorphous silicon.**

SilcoNert<sup>®</sup> 2000 (formerly known as Siltek<sup>®</sup> and Sulfinert<sup>®</sup>) is a chemically protective barrier of amorphous silicon that is further functionalized to provide the most inert surface available. SilcoNert<sup>®</sup> 2000 is a required surface treatment when analyzing trace levels (at parts-per-million and below) of compounds, especially highly active species like H<sub>2</sub>S, mercaptans, NO<sub>x</sub>, SO<sub>x</sub>, mercury, and more.

# Silcolloy<sup>®</sup>

**Silcolloy is a multi-layered amorphous silicon coating with no added functionalization.**

Silcolloy<sup>®</sup> is ideal for extending the life of components in acidic, corrosive, oxidative, and high temperature environments. This coating on stainless steel is also an excellent replacement for more expensive alloys and materials. Just like all SilcoTek<sup>®</sup> coatings, Silcolloy<sup>®</sup> will not flake or generate particulate, even in highly sensitive environments like semiconductor manufacturing.

# Dursan<sup>®</sup> NSF

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

Dursan<sup>®</sup> is our most versatile coating, offering corrosion resistance, chemical inertness, hydrophobicity, slip, non-stick properties and more. Dursan<sup>®</sup> is NSF certified and FDA compliant. This coating is the best choice for the harshest and most challenging applications. Dursan<sup>®</sup>-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.



*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
<b>SilcoNert 2000:</b>	<b>(Chemical Inertness, 4) (Hydrophobicity, 3) (Acid Corrosion Resistance, 2) = 9</b>
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
<b>Dursan:</b>	<b>(Chemical Inertness, 3) (Hydrophobicity, 3) (Acid Corrosion Resistance, 4) = 10</b>
Dursox:	(Chemical Inertness, 2) (Hydrophobicity, 1) (Acid Corrosion Resistance, 4) = 7

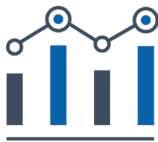
*According to the sums, Dursan is the best option and SilcoNert 2000 is the second best option. Because the application indicated a need for acid corrosion resistance and a wide pH range, **Dursan is the best choice for this application.***

## 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 [SilcoD@SilcoTek.com](mailto:SilcoD@SilcoTek.com) or 814-353-1778 if you are unsure.

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

SilcoTek Coating	<a href="#">SilcoNert® 1000</a>	<a href="#">SilcoNert® 2000</a>	<a href="#">SilcoGuard®</a>	<a href="#">SilcoKlean®</a>	<a href="#">Silcolloy®</a>	<a href="#">Dursan®</a>	<a href="#">Dursox®</a>	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



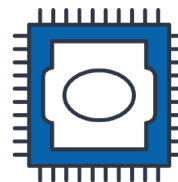
## Chromatography and Analytical Chemistry

### 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

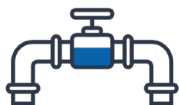
### Benefits

- 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



## 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



## 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



## 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



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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**

Except where prohibited by law, SilcoTek will not be liable for any loss or damage arising from the SilcoTek coating whether direct, indirect, special, incidental, or consequential, regardless of the legal theory asserted, including warranty, contract negligence, or strict liability.

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