

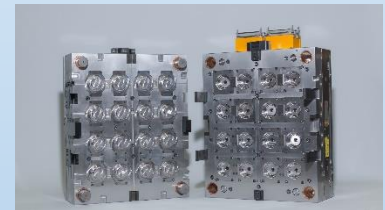


**Game-Changing Coatings™  
for the Plastics Molding Industry**



# Presentation Contents:

- An Overview of SilcoTek Corporation
  - SilcoTek's CVD Coating Process
  - SilcoTek's Coating Solutions for the Plastics Industry
  - Applications of SilcoTek's Coating Solutions in the Plastics Industry
  - Biocompatibility Testing, Certifications and Compliance of SilcoTek's Coatings
  - Options to Evaluate SilcoTek Coated Parts at Your Facility
  - Resource Information about SilcoTek's Coatings
  - Questions
- 



# An Overview of SilcoTek

- Year Founded: 2009
- Number of Employees: 60
- Our Mission: To create game-changing coatings
- Our Business: Chemical Vapor Deposition (CVD) coating services



# An Overview of SilcoTek

## Our History:

### ➤ 1987

Restek invents Silcosteel to coat SS tubing for the chromatography industry

### ➤ 1990-2000

A team is formed at Restek to investigate new coatings for other applications and markets

### ➤ 2000 - 2008

Launch and growth of Restek Performance Coatings Division

### ➤ 2009

Restek Performance Coating Division spins off to form SilcoTek

### ➤ 2013

SilcoTek builds 36,000 ft<sup>2</sup> state-of-the-art coating facility

### ➤ 2019

32,520 ft<sup>2</sup> addition to the original facility is completed adding additional coating capacity and office space

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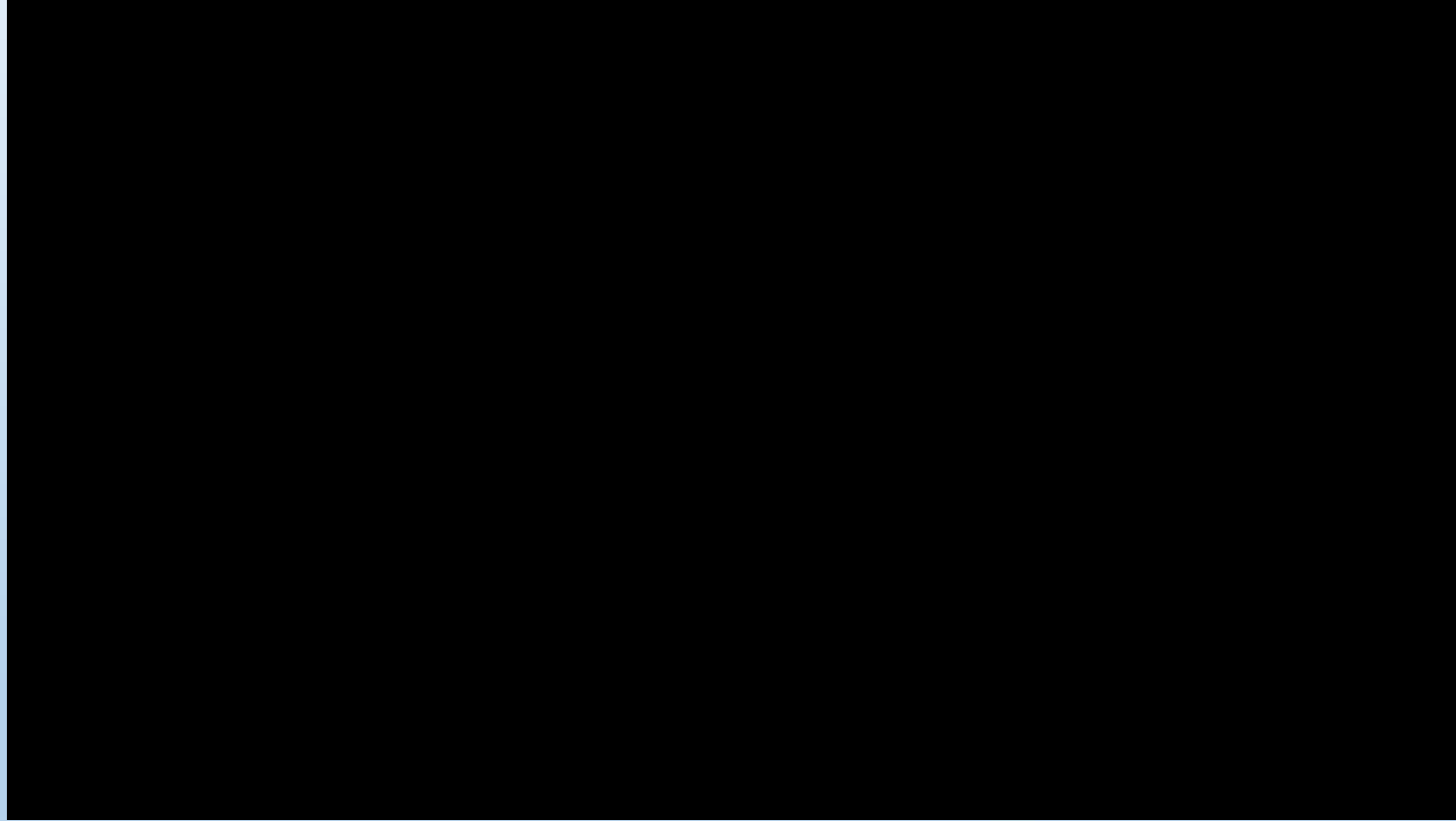
# An Overview of SilcoTek

## Our Markets:

- Plastic Molding
- Medical (Pharmaceutical, Clinical Diagnostics and Devices)
- Packaging
- Oil and Gas Exploration and Production
- Refining
- Gas and Liquid Chromatography
- Semiconductor Manufacturing
- Process Analytical
- Chemical Manufacturing
- Aerospace
- Automotive

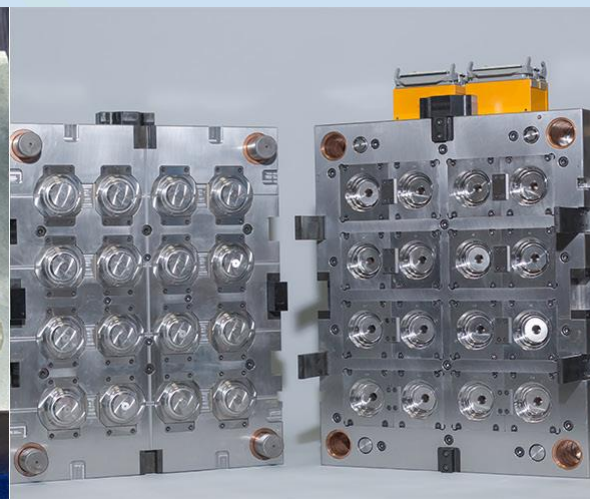
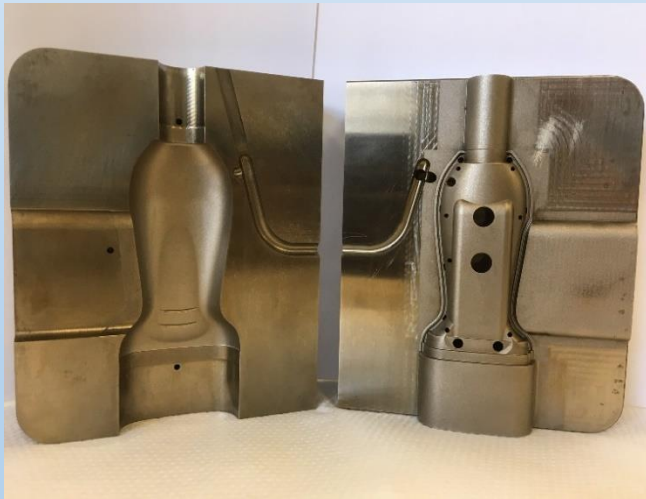


# SilcoTek's CVD Coating Process





# SilcoTek's Coating Solutions for the Plastics Industry



# What Problems in Plastic Molding Can be Solved Using SilcoTek's Coating Technology?

## Problem #1:

- Sticking of plastic, silicone or rubber materials to mold surfaces or other molding equipment parts

## Problem #2:

- Corrosion of metal surfaces of molds and other metal parts in the molding equipment

## Problem #3:

- Use of expensive mold release agents

## Problem #4:

- Cleaning of molded parts to remove residual plastic materials and release agents





# What Solution Can SilcoTek's Coating Technology Provide to Solve These Problems?



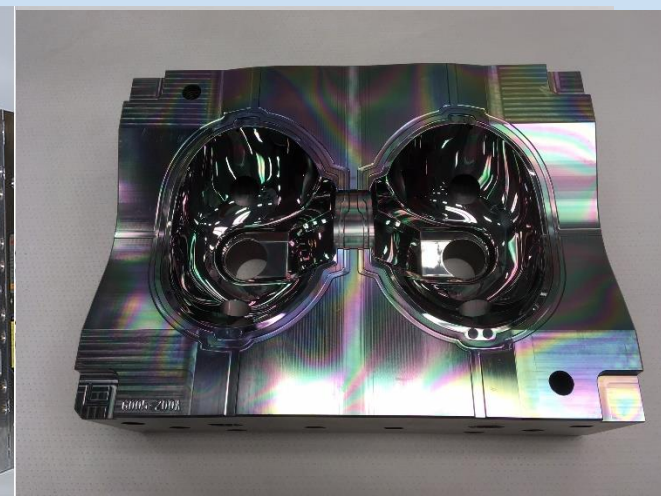
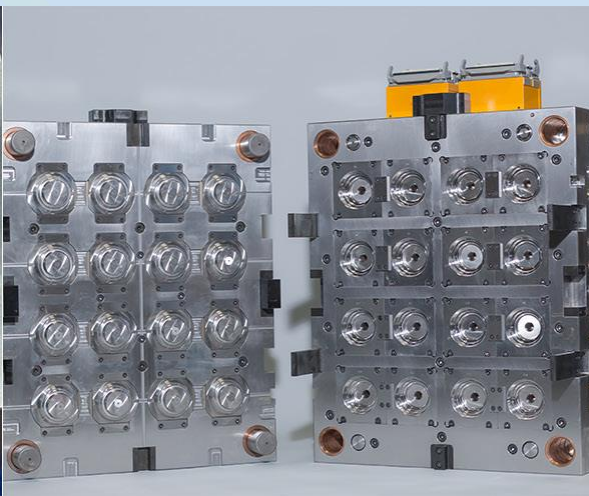
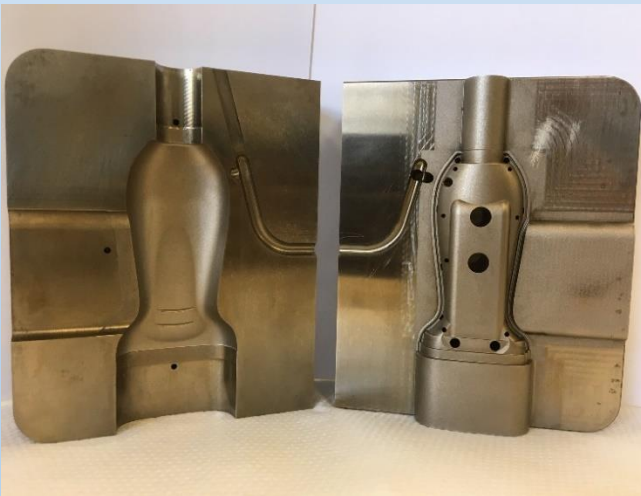
- SilcoTek's Dursan is an amorphous silicon oxide ( $\alpha\text{-SiO}_x\text{CH}_y$ ) coating applied via our proprietary CVD (Chemical Vapor Deposition) process
- It can be applied to metal substrates, such as stainless steel, carbon and tool steel alloys as well as aluminum
- Application specifications include:
  - operating temperature range of 450°C to -210°C
  - thickness of 400 – 1600nm
  - contact angle of  $\geq 81^\circ$
  - allowable pH of 0 - 14



# What are the Performance Benefits of using Dursan® in my Plastic Molding Processes?

- **Provides Lower Surface Energy....**  
Releases your molded parts quickly and easily for higher yields resulting in longer up time
- **Prevents corrosion...**  
Protects your mold and liquid cooling line substrates to reduce costly maintenance
- **Creates No Changes to the Dimensions or Surface Finish of Your Mold...**  
Dursan is very thin and does not affect critical dimensions or surface finishes
- **Replaces the Need to Constantly Re-apply Mold Release Agents...**  
Dursan is molecularly bonded to metal substrates so it is long lasting
- **Eliminates the Need for Post Cleaning of Molded Parts...**  
Unlike mold release agents, Dursan does not transfer onto molded parts due to its abrasion resistant durability
- **Safe to Use...**  
Dursan has passed USP Class VI Plastics testing and is certified by NSF International

# Applications of SilcoTek's Coating Solutions in the Plastics Industry





# What Types of Plastic has Dursan<sup>®</sup> Successfully Being Used With?

- Polyethylene Terephthalate (PET)
- Polyvinyl Chloride (PVC)
- Polyurethane (PU)
- Polypropylene (PP)
- Pebax
- Nylon



Based on the successful applications of the use of Dursan with the above materials, we are confident that it will also be successful during the molding of other plastic resins as well as rubber and silicone compounds.

# What Applications in Plastic Molding has Dursan® Being Successfully Used In?



## Injection/Blow Molding: Food Containers

- PET is commonly used in food and beverage container molding and is a very sticky plastic material.
- Dursan, with its' low surface energy, is a very good choice to coat molds to provide an easier release of molded PET containers
- Customer experience has shown very positive results with the use of the Dursan to achieve better release of PET food containers.
- This success has provided lower production costs due to:
  - less rejected product
  - less labor time to clean molds
  - more production uptime
- The durability of the Dursan in this application has confirmed that after (4) plus months of continuous use there was no measurable loss of the coating thickness.



# What Applications in Plastic Molding has Dursan® Been Successfully Used In?



## Injection Molding: Plastic Face Masks

- PVC is commonly used in making bottles, non-food packaging, food-covering sheets, and cards (such as bank or membership cards)
- Dursan, with its' low surface energy, is a very good choice to coat molds to provide an easier release of molded PVC products
- Customer experience has shown very positive results with the use of the Dursan to achieve better release of molded PVC products such as face masks
- This success has provided lower production costs due to:
  - the elimination of labor time to manually release molded product
  - higher yield of products and more production uptime
- The use of Dursan in this application has confirmed better production efficiencies and improved the corrosion resistance of the mold from the out gassing of molded PVC

# What Applications in Plastic Molding has Dursan® Being Successfully Used In?



## Thermoforming: Catheters

- Tapered tips or tailor-made tube ends are sometimes required for catheters.
  - These special features can be achieved through the application of forming and shaping techniques such as Thermoforming which is a heat induction method.
  - The tools used in Thermoforming are very small diameter metal rods that are heated.
  - This heating creates the plastic material to become soft and sticky during the forming process.
  - Dursan prevents the plastic material from sticking to the metal rod during the Thermoforming process.
  - This performance benefit decreases down time and reduces cost due to required cleaning or replacement of thermoforming rods.
-

# Biocompatibility Testing

**Dursan**® has passed the following Biocompatibility Tests:

- **USP Biological Reactivity Tests, *In Vivo* / USP Plastic Class VI**
- **Cytotoxicity Study Using the ISO Elution Method**

All of the above tests were completed by **NAMSA**, a very reputable test laboratory, which was the first independent company in the world to focus solely on testing medical device materials for safety.

**NAMSA**®

# Certifications & Compliance Statements

- **SilcoTek® is ISO 9001:2015 certified by the independent auditing firm BSI America Inc.**

Registration to ISO 9001 demonstrates SilcoTek's commitment to Zero Customer Disappointments, continuous quality system improvement and customer service.



- **NSF (National Sanitation Foundation) Certification**

Our [Dursan®](#) coating is compliant with NSF/ANSI 51 and all applicable requirements. This means that it is safe for food contact and also meets the FDA's requirements for compliance.



- **California Proposition 65**

SilcoTek® coatings do not contain chemicals which are listed on the state of California Safe Drinking Water and Toxic Enforcement Act of 1986, California Proposition 65. Proposition 65 protects California drinking water from contamination by chemicals known to cause cancer, birth defects, and other reproductive harm.



# Certifications & Compliance Statements

- **RoHS 3: Restriction of Hazardous Substances Directive 2015/863/EU**

SilcoTek® coatings do not contain any compounds at levels exceeding RoHS compliance limits such as Cadmium, Mercury, Lead, etc.



- **REACH-SVCH: Registration, Evaluation, Authorization, and Restriction of Chemicals - Substances of Very High Concern**

SilcoTek coatings do not contain any of the 201 REACH Substances of Very High Concern (SVHC) as updated by the European Chemicals Agency (ECHA)



- **Safety Data Sheet (SDS) Exemption**

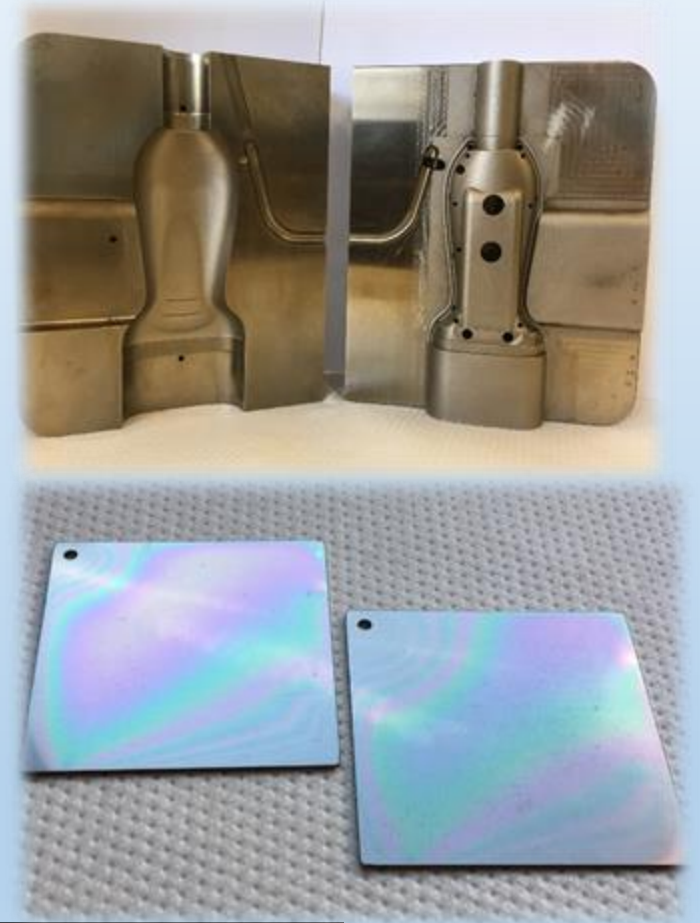
SilcoTek® does not provide SDSs for our coatings as they are not hazardous chemical products.



# What are my Options to Evaluate Dursan in my Molding Application?

**There are (2) options:**

- Ship your molds and/or mold related parts to SilcoTek to be coated to evaluate the performance benefits of Dursan in your production line.
- Request Dursan coated test coupons to be shipped to your facility to be evaluated in a laboratory scaled environment.



# Need Additional Information about SilcoTek and our Coatings?

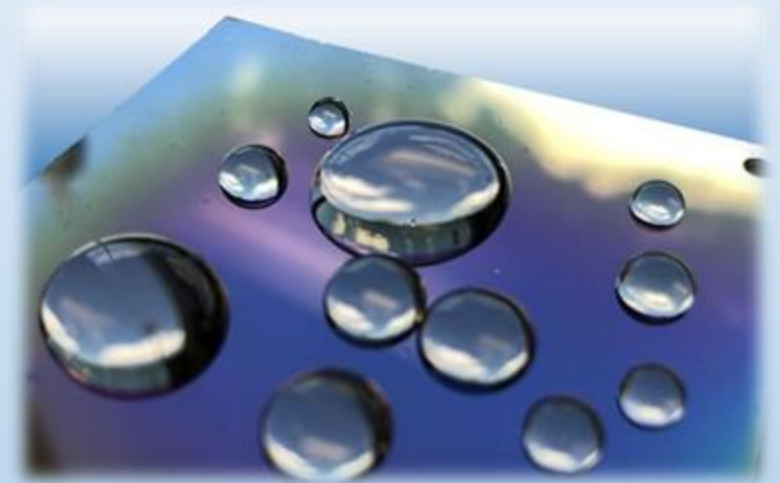
**Be sure to visit SilcoTek's website for additional resource information such as:**

➤ Literature:

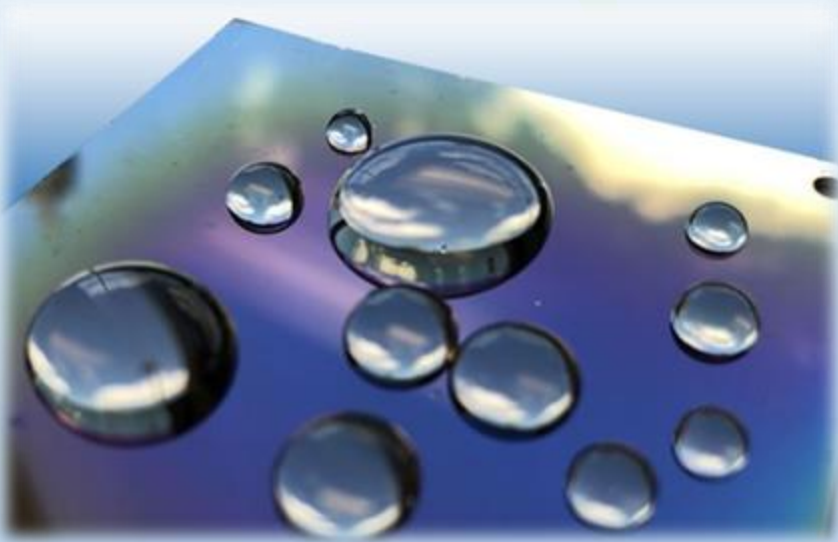
- “CVD Coatings for Plastic Molding” Application Brief
- SilcoTek 101 Brochure
- Dursan Coating Data Sheet
- Coating Material Compatibility Guide
- Coating Chemical Compatibility Chart
- Coating Application Guide
- Coating Case Studies

➤ Services

- Get Technical Support
- Receive no-charge “evaluation coupons” for initial testing
- Request a Quotation



# Questions?



# Thank You for Your Time to Review Our Presentation!

