



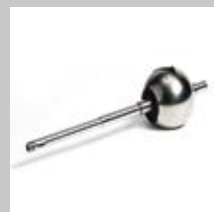
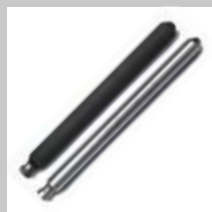
PRAXAIR
SURFACE TECHNOLOGIES

Oil/Gas/Petrochemical



Get more

Praxair Surface Technologies delivers more experience,
more innovation, more options and more support



Get more with Praxair...

Customized answers. Praxair Surface Technologies EXTREME Protection™ and ProtectionPLUS™ coatings combined with SermeTel®, SermaGard®, SermaLon® and SermaLube® slurry coatings for the ultimate in flexibility, ensuring we have the right answer for your unique challenge.

Design and application support. Our coatings help bring out the best in your components, while you always get the confidence of knowing your parts have been through real-world simulations.

Uniformity and repeatability. Whether your parts are produced in the Americas, Europe or Asia, you know you're getting consistent results you can rely on.

Innovation. Our scientists, renowned throughout the coating industry, rank among the most authoritative sources in application techniques, always looking for new surface enhancement options.

What does it mean to get more?

At Praxair, we go beyond the surface for individualized answers to your toughest problems



At Praxair Surface Technologies, we understand that your customers' requirements demand *more*. That's why we're dedicated to helping you deliver *more* product life, *more* ways to reduce operating costs, *more* ways to improve performance, *more* risk mitigation. Partner with us and you get *more* than protective coatings—you get complete access to our exclusive global network of resources.

> Look for more

At Praxair Surface Technologies, we have *more* down to a science. Look for the “greater than” symbol (>) to find out how working with us helps you get *more*.

> EXCLUSIVELY MORE: PRAXAIR'S INDUSTRY-LEADING EXTRAS

- Coating Design Optimization Unit
- EXTREME Protection™ and ProtectionPLUS™ Coatings
- Operational Excellence System
- Product Discovery Labs

> More than half a century of leadership

Since the early 1950s, Praxair Surface Technologies has been partnering with original equipment manufacturers (OEMs), airlines, and maintenance, repair and overhaul companies (MROs) to extend the life cycle and performance of critical components. Our expertise in wear- and corrosion-resistant coatings has made us the preferred supplier in the industry.

Why does more matter?

When you get *more*, you can give *more*. Parts that include our advanced surface technologies help you improve component efficiency, performance and life—all of which enhance the overall performance of your product and the value you offer your customers while increasing your profitability. *More matters.*

The evolution of more



> 1904 More tradition

Concentrated Acetylene Company (later known as Prest-o-Lite) is formed, creating headlights for early automobiles. Our work with acetylene would one day lead to the discovery of today's surface coating technology. We don't just date back to the beginning—we are the beginning.

Oil/Gas/Petrochemical Coating Applications

- Ball valves
- Blowout preventers
- Choke valve inserts
- Compressor piston rods
- Connector pins
- Down hole logging and inspection tools
- Drill bits
- Gate valves
- Hydraulic cylinders
- Mandrels
- Plungers
- Riser tensioners
- Rotors
- Rub shoes
- Seals
- Shock absorbers
- Stabilizers
- Stems
- Wash pipe

Coating Design Optimization Unit

More real-world component coating design and application support

The first step to finding the right answer for your needs is determining not only what those needs are, but also how a surface coating can bring out the best in your component or part. That's where our Coating Design Optimization Unit comes in. It works with your engineers and designers, integrating more than a half century of coating expertise with planning of the part's production. Partnering with our Coating Design Optimization Unit from the beginning ensures you get *more* produceable coatings, *more* protection, *more* customization and *more* performance from your part.

Our team begins by identifying:

- Function of the coating (wear/corrosion resistance, sealing, etc.)
- Geometry, composition and properties of the substrate
- Environmental and production impact (corrosion, pressure and operating environment)

Once we've narrowed down the possible coating alternatives, we test each coating on your part in environmental simulations that replicate your everyday operating environment. When this exhaustive testing process is complete, you'll have more confidence knowing exactly how coatings will perform on your part day in and day out.

Real-world environmental testing simulates:

- Abrasion and impact wear
- Adhesion
- Bond strength
- Cavitation
- Corrosion
- Fatigue
- Galling/sliding
- Oxidation and extreme temperatures
- Particle and water erosion

Answers in action:

We customize our answers to fit your individual problem. For example, what if you need only one section of a component coated? We can design a custom fixture that will limit coating area, avoiding resource-consuming tasks like grinding.



> 1948 More explosive discoveries

Explorations into acetylene detonations lead to the discovery of a new groundbreaking flame-plating process. The technique developed from this breakthrough—which uses a “detonation gun”—forms the foundation of the modern thermal spray industry. To this day, we are the only company that can offer D-Gun and Super D-Gun® coatings, both benchmarks of the industry.

EXTREME Protection™ and ProtectionPLUS™ Coatings

More options for customized answers

There is no one coating answer to every surface problem. Your unique problems require unique answers. That's why we created our EXTREME Protection™ and ProtectionPLUS™ lines of surface coatings.

Our EXTREME Protection™ proprietary coatings are designed to provide customizable answers you can't get anywhere else.

Our ProtectionPLUS™ coatings are used throughout the industry and feature the additional, exclusive application techniques and knowledge-base of Praxair Surface Technologies. In fact, we originally developed and patented many of these methods and materials.

➤ Engineered for oil, gas and petrochemical

The oil, gas and petrochemical industries present unique challenges: parts need to withstand corrosion, wear and intense pressure. That's why our surface enhancement solutions are designed with the toughest jobs in mind. Our advanced technology is designed to help your customers:

- Extend product life of critical parts
- Reduce repair/replacement costs and downtime
- Increase the use of advanced materials and component designs

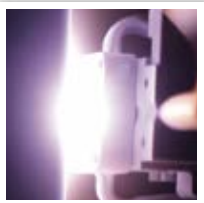
Answers in action:

We not only protect but also restore. We have in-house services that can strip, weld and remachine worn components.

More coating options

COATING SERVICES

- Abradable coatings
- Conductive coatings
- Corrosion-resistant coatings
- Hardface coatings
- Oxidation-resistant coatings
- Pure metal coatings
- Release coatings
- Rub-tolerant coatings
- Solid particle erosion-resistant coatings
- Thermal barrier coatings
- Wear-resistant coatings



➤ 1958 More exclusive innovations

The innovations continue as we develop our exclusive plasma coating technique—which once again revolutionizes the thermal coating industry, delivering an exceptionally versatile solution.



➤ 1962 More flexibility

A breakthrough coating process, high-velocity oxy-fuel (HVOF), is developed that introduces powders of metals or ceramics into a high-temperature, high-velocity gas stream. The stream then heats and propels them against a prepared surface. The result is excellent wear and corrosion resistance.



Operational Excellence System

More uniformity, consistency and repeatability

From the initial conversation to the final inspection, the application of your coating follows our strict Operational Excellence System. This process guides our industry-leading quality control programs and guarantees consistent, uniform results that are on time, every time.

At the core of Operational Excellence are Six Sigma quality tools and a complete set of lean manufacturing techniques. Instead of batch production, we focus on one-piece-flow pull production that improves quality and shortens cycle and changeover times—which greatly improves turntimes for your applications.

Operational Excellence also allows us to deliver uniform, repeatable results you can rely on. You can be confident that whether your part is coated in the Americas, Europe or Asia, the processes—and coatings—are indistinguishable. *More usable parts, less risk.*

> Vertical integration

Praxair Surface Technologies controls the entire coating process from receipt of your component to completed coated part. Not only do we manufacture the gases, powders and slurries used to make the coatings, but we also invented many of the processes used to apply them.

Certified to serve

Our facility certifications include:

- API
- AS9100 and 9100B
- ASD-EASE
- ASME
- CAAC
- CAA/JAA
- DOD
- EASA
- FAA
- ISO 9001:2000 and 9001:2008
- MOD
- NADCAP
- NBBI
- Op Specs



Protective coating being applied to ball valve to combat corrosion and wear.



> 1965-69 More global uniformity

The first overseas production plants open in England, Japan and Switzerland as our unique quality control process begins to develop, ensuring uniformity and repeatability regardless of the component or continent.



> 1992 More efficiency

We become the independent company you know today: Praxair Surface Technologies. The change gives us greater control over raw materials and resources, enabling us to become the first vertically integrated operation in the industry. In 1998, ASM International recognized the Speedway (Indianapolis) Laboratories as a historical landmark.

Laser-Clad Applications

- Connector pins
- Gate valves
- Hydraulic cylinders
- Riser tensioners
- Seals
- Shafts

Laser-Clad Coatings for Hydraulic Cylinders on Offshore Oil Platforms

Constant exposure to seawater in the splash zone can quickly corrode direct-acting riser tensioners on drill ships. Praxair Surface Technologies has applied a super alloy via laser cladding to almost 300 rods since 2003 with no signs of corrosion or wear.



Product Discovery Labs

More innovative answers

At Praxair Surface Technologies, we have a long-standing tradition of excellence in innovation. Many of the materials and processes in use today throughout the industry began in our world-class Product Discovery Labs. The focus of these labs is singular: develop next-generation surface coating technologies that solve the performance problems you face today and tomorrow.

➤ *Top research scientists*

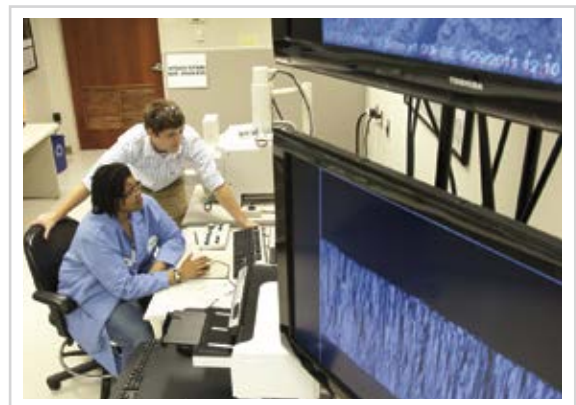
We provide access to the most renowned scientists in the coatings industry. These highly qualified professionals have published extensively and, in many cases, literally *written the book* when it comes to application techniques. Working with a staff of experienced lab technicians, specialists and research engineers, our scientists are continually developing new coating processes and products that are designed to find real-world, groundbreaking answers to even your toughest performance problems.

➤ *More discovery*

Coating processes that are the foundation of today's surface technologies were invented by Praxair Surface Technologies, including:

- Detonation gun (D-Gun) coating process*
- Super D-Gun® coating process*
- HVOF (High-Velocity Oxy-Fuel) coating process
- Plasma spray coating process
- Tribomet® electrodeposition coating process*

* Exclusive, proprietary Praxair Surface Technologies process



Ongoing testing is critical for discovering new ways to solve your performance problems.



➤ *2000 and beyond: More advances*

We expand our product and service offerings by acquiring SermeTel®, SermaLoy™, SermaFlow®, SermaGard®, SermaAlcote™, SermaLon® and other high-performance slurries. Our newest advances provide even greater safety, durability and efficiency to many industries. Our legacy of innovation continues as we experiment with advanced additive manufacturing powders and innovative new processes. Our commitment to constant improvement will keep Praxair Surface Technologies on the leading edge of the industry for decades to come.



What can more mean for you?

Let's work together to find your answers



It starts with a conversation. It ends with an answer to even your toughest performance problems. The unmatched service, experience, innovation and dedication between those two points? That's *more*. We offer *more* support, *more* coatings, *more* knowledge, *more* testing, *more* consistency. No one else even comes close. For answers to the tough problems, demand *more*.

Surface technologies

- Cold Spray – LOXPlate® coating
- Dry Film Lubricants – SermaLube®
- Fluoropolymers
- High-Performance – Organic Coatings
- High-Performance Slurry
 - SermaLon® – Metallic ceramic polymers
 - SermeTel® and SermaGard® – Metallic ceramics
- High Power Laser Processing
 - Laser Cladding/Hardfacing
 - Laser Hardening
 - Laser Welding
- Phosphates
- Thermal Spray Coatings
 - D-Gun and Super D-Gun® coatings
 - High-Velocity Oxy-Fuel (HVOF)
 - CoreGard™ inner diameter coatings
 - Plasma Spray
 - Wire Arc Spray

Inspecting and testing

- Eddy current
- ETC-2000 automated eddy current
- Gaging and dimensioning
- Liquid penetrant
- Magnetic particle
- Moment weighing
- Profilometer
- X-Ray

Finishing and machining

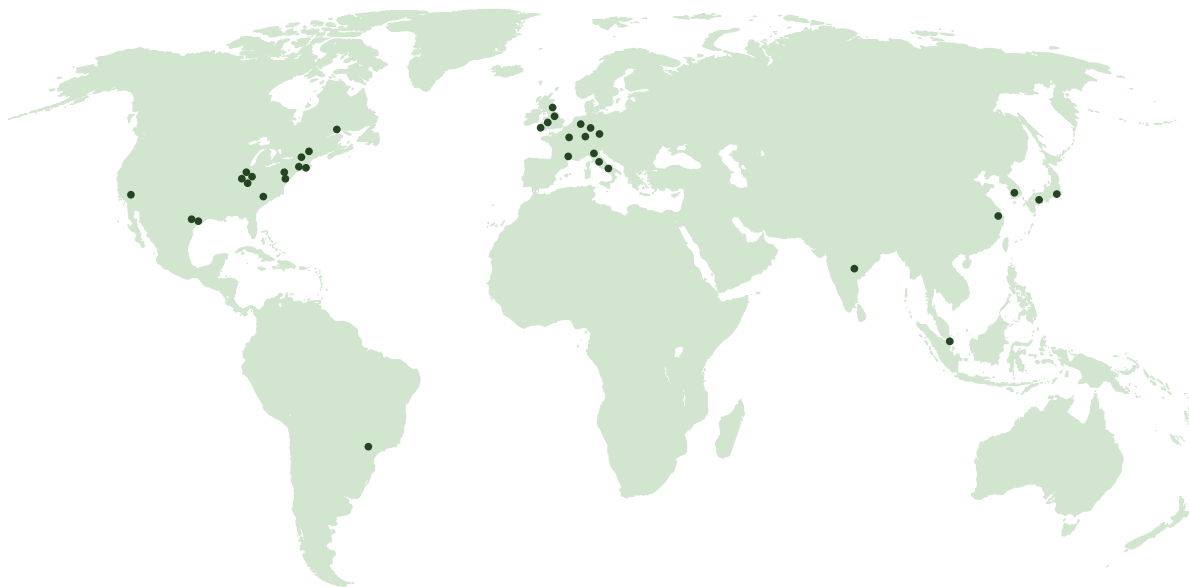
- Belting
- Brushing
- Drilling
- Grinding
- Honing
- Lapping
- Machining
- Polishing
- Sanding
- Vibratory

Other service operations

- Balancing
- Chemical stripping
- Creep forming
- Electrolytic stripping
- Glass beading
- Graphite varnishing
- Grit blasting
- Heat treating (in air)
- Heat treating (in vacuum)
- Moment weighing
- Sealing
- Shot peening
- Ultrasonic cleaning
- Vapor degreasing

Oil/Gas/Petrochemical

2,500 people, more than 30 facilities and 12 countries



Primary Facilities

Brazil

Pinhais, Brazil
Tel. +55.41.3661.6200

Canada

Dorval, Quebec, Canada
Tel. 514.631.2240

China

Changzhou, China
Tel. +86.519.8622.9000

France

St. Etienne, France
Tel. +33.4.77.42.62.62

Germany

Duisburg, Germany
Tel. +49.203.935842 Ext. 0

Ratingen, Germany

Tel. +49.2102.495.0

Schlüchtern, Germany

Tel. +49.6661.96780

India I and II

Coimbatore, India
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Italy

Fornovo, Italy
Tel. +39.0525.401704

Monte Marenzo, Italy
Tel. +39.0341.601111

Novara, Italy
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Okegawa, Japan
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Singapore
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South Korea

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Southam, England
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Swindon, England
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Weston-super-Mare, England
Tel. +44.1934.411301

United States

Compton, CA
Tel. 310.604.0018

Manchester, CT
Tel. 860.646.0700

North Haven, CT
Tel. 203.287.2700

Indianapolis, IN
Tel. 317.240.2500

Biddeford, ME
Tel. 207.282.3787

Charlotte, NC
Tel. 704.921.5400

New Castle, PA
Tel. 724.598.1300

Houston, TX
Tel. 713.849.9474

Tel. 713.991.8700

Praxair Surface Technologies maintains additional coating and administrative facilities not listed above.



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