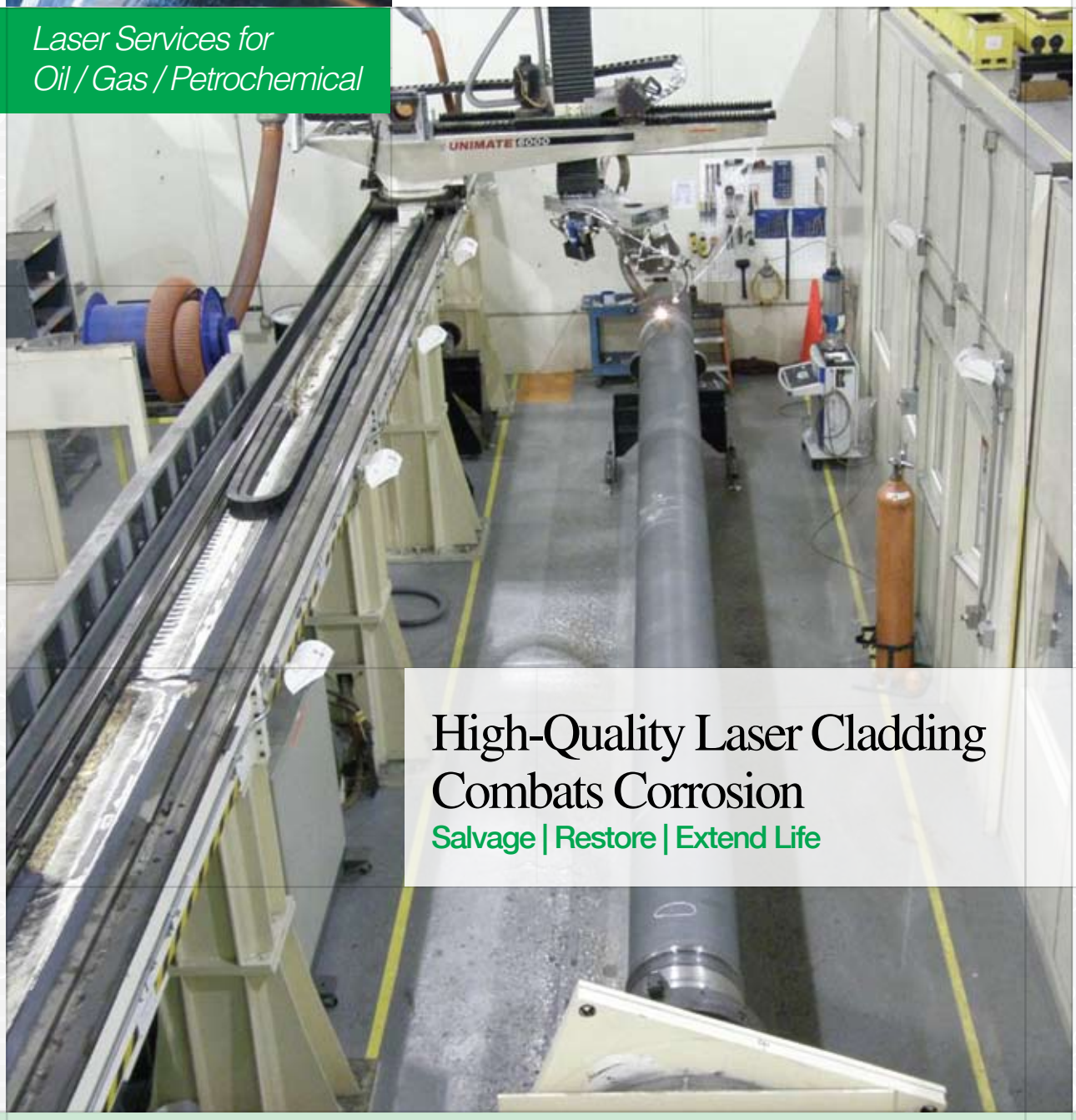
PRAXAIR
SURFACE TECHNOLOGIES

Laser Services for
Oil / Gas / Petrochemical



High-Quality Laser Cladding Combats Corrosion

Salvage | Restore | Extend Life

Laser Cladding | Laser Hardfacing | Laser Welding

Laser Hardening | 7 Laser Systems (1µm and 10 µm)

Up to 25 kW of Beam Power | 9 Multi-Axis Robotic Workstations

Grit Blasting | Heat Treating | Finishing | Certified by ASME (S-31,991) and National Board of Boiler and Pressure Vessel Inspectors (R-5623)

Praxair Surface Technologies. Not the same old coatings.

Praxair Surface Technologies develops innovative laser processing technologies specifically geared for the tough demands and harsh environments of the oil, gas, and petrochemical industries.

That's why more companies are turning to Praxair to prevent wear and corrosion on critically important components.

We don't just sell off-the-shelf solutions—**Praxair works to solve your problem** instead of simply coating over it.

Laser cladding can salvage worn or damaged parts and restore them to original condition with added corrosion or wear protection.

When you call on Praxair, you **tap into R&D resources unmatched in the industry**. It includes teams of specialist engineers and PhDs with the knowledge, experience, and support **to combat the toughest problems**.

We partner with you, studying how and where your component is used and analyzing the wear and corrosion it encounters. That team-oriented approach ensures that **you get an outcome that meets your technical and budgetary requirements** – a laser overlay that is reliable, cost-effective, and repeatable.

Unlike other coating companies, we develop and manufacture our own gases and many of the powders, processes, and equipment we use. This enables our R&D teams to explore new approaches based on your exact needs. And, it allows us to manage the process every step of the way, for the tightest quality control.

In the final stage, your component's overlay is inspected to your specifications, including chemistry and liquid dye penetrant. This inspection translates into a significant competitive edge in dependability and service life.

When you need a surface enhancing technology that works better, you can count on Praxair.

Laser Precision, Impenetrable Bond

Our ISO 9001:2000 certified **laser cladding process offers a metallurgically bonded overlay with very low dilution of the deposited alloy**. Laser cladding involves the use of powder that is efficiently melted by a laser beam and precisely deposited onto the substrate material to create a corrosion-resistant surface layer.

Our laser cladding is based on powder-feed technology, so there's **no mechanical impact and more options for coating materials**. And, because we manage the entire process in-house, the quality control is tighter.

Benefits of Laser Cladding

- Boosts performance of components used in harsh environments
- Extends life of new, high-value components
- Salvages worn or damaged parts for longer service
- Restores parts to original dimensions
- Reduces maintenance, repair, and equipment replacement costs

Features of Laser Cladding

- Impenetrable metallurgical bond
- Unique coating morphologies
- Dense, thin coatings for enhanced corrosion resistance
- Single layer achieves specified surface chemistries
- Narrow heat-affected zone
- Minimal thermal distortion
- Low dilution of deposited alloy
- Handles complex geometries

Extend service life of critical components.

Proven onshore and offshore applications.

Significant Edge over Other Coating Processes

How do you know when your coating process needs to be replaced? When bond line failures and corrosive attack occur due to the mechanical bonds and porosity in coatings. When an overlay is needed on tight tolerance parts. Or, when a single-pass overlay requires good chemistry. Laser cladding is the answer.

Laser Cladding vs. Thermal Spray

Thermal spray coatings offer a mechanical bond that makes them permeable, suffers from coating thickness limits, and can't handle stress. Thermal spray is also a line-of-sight process, so it isn't able to coat around corners or irregular-shaped parts like laser cladding can.

Laser Cladding vs. Conventional Welding

Conventional welding, including MIG, hot-wire TIG, and PTA welding, requires a high heat input that leads to part distortion and material malformation. The mechanical impact of the arc on the melt pool in conjunction with the extreme temperatures in the plasma generated by the arc causes significant and locally inconsistent dilution of the overlay material.

Applications

Laser cladding provides proven protection to a variety of high-value components in both onshore and offshore oil and gas applications such as the seal area of hydraulic cylinder rods and connector pins, gate valves and seats, shafts, and risers.

The oil, gas, and petrochemical industries are in good company. Other industrial applications where components also work under extreme conditions benefit from laser cladding, including boiler wall panels and industrial gas turbine diaphragms used in power generation, as well as bearing systems for zinc pot rolls in steel production.

Part Size Capabilities (up to)

- 40,000 pounds
- 90-foot length; 60-foot continuous processing

Materials Commonly Used

Alloy	*Powder*
Stainless Steel Alloys	309 | 316L | 410 | 420 | 17-4 pH
Nickel Alloys	Hastelloy® C-22 | Inconel® 625 | Colmonoy®
Cobalt Alloys	Ultimet® | Stellite® 6, 12 | CCW®
Tungsten Carbide Composites	Ni-Tung® 60 | Colmonoy® 75, 80, 83 | Praxair® 7707

Laser Processing for Oil, Gas, and Petrochemical Operations

Other surface-enhancing technologies that may interest you include thermal spray and electrodeposition coatings. Our coatings and laser weld overlays are offered in a job-shop environment.

Praxair Surface Technologies operates in 10 strategic countries from more than 30 facilities to meet the needs of a variety of industries.

To learn more about Praxair's laser processing services for the oil, gas, or petrochemical industries, contact us at:

www.praxairsurfacetechnologies.com

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