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# The Plasma Torch and Chromium Oxide Coating

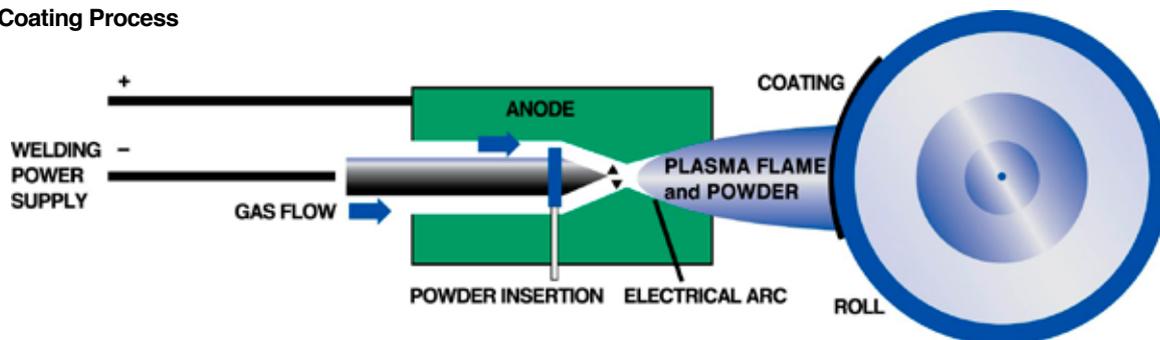
For many years, Praxair Surface Technologies has been an industry leader in the development of wear-resistant coatings. For anilox rolls, the printing industry needs a coating that can tolerate the corrosive environment of water and solvent-based inks, and the abrasive wear from doctor blades that constantly travel the roll surface.

Together, the Praxair Surface Technologies' plasma torch and the UCAR® chromium oxide coating it applies, create the hard, ceramic surface necessary to make PST anilox rolls outperform other anilox rolls.

Coating material, in powder form, is injected into the torch so that it also passes through the arc. Heat from the plasma flame has a core temperature of about 50,000°F (30,000°C), which melts the coating material so that it will adhere to the parts being coated.

To apply the coating to a roll, the flame containing the molten powder is directed at the roll surface as it is rotated in front of the torch. The rotation speed and rate of torch movement along the roll determine the coating thickness.

Figure 1.  
Plasma Coating Process



## The Plasma Torch

The plasma torch gets its name from the gas plasma, or ionized gas, it creates to apply the coating. Nitrogen gas flows through the torch to an anode/nozzle that is positively charged by a welding power supply. A cathode, positioned in the gas stream near the anode, is connected to the negative side of the power supply and creates an electrical arc. The gas flows through this high-energy arc and ionizes. The heat that results causes the gas to expand producing great pressure. This pressure escapes through the nozzle opening in the anode to form a high velocity stream of hot, expanding, plasma flame.

## Chromium Oxide Coating

The molten chromium oxide material applied by the Praxair Surface Technologies' plasma torch flame becomes the coating on the roll surface that must be wear and corrosion-resistant.

Yet to complete an anilox roll, a honeycombed matrix of cells must be laser engraved into the coating surface to meter ink at a precise volume. The coating material must accept this engraving process, retain its original characteristics, and maintain its surface integrity.

Praxair Surface Technologies' meets all of these criteria. It is corrosion-resistant, and it is hard. Hardness is quantified by measuring the indentation from a precise instrument. Much harder than competitive coatings, must measure an average of 1300 on the Vickers scale (approximately 72 Rockwell C). Greater hardness means greater wear resistance in the operating environment.

The coating's bond strength to the surface of a roll is in excess of 5000 psi (measured per ASTM C633). This means it will stay in place on the roll surface in the most demanding applications. Because the coating structure has little apparent porosity (typically measured at less than 2%), it protects the roll material beneath the coating from water or solvent that may weep through competitive coatings that are more porous, and lead to coating bond failure. After is applied, the coating surface is sealed with a proprietary epoxy sealer. This sealer protects the coating and the roll base beneath it, from potentially corrosive environments, like inks or solvents.

Low porosity also makes a smoother coating surface and a more precise engraving. When is engraved with an anilox cell structure, it retains all these desirable chromium oxide properties and the result is an anilox roll with the surface hardness, corrosion resistance, and cell volume to meet the most stringent expectations of the printing industry.

In addition to making the powder that becomes the coating, and the plasma torch that applies the coating, Praxair Surface Technologies laser engraves the ink-carrying anilox cells into the coating with the same precision it brings to the coating process. All these steps involved in producing each Praxair Surface Technologies laser engraved ceramic anilox roll are conducted with rigorous quality assurance and statistical process control monitoring.

## How to Get Started. Contact Us Today.

Ask a Praxair printing specialist to recommend the best engraving for your application.

Call the nearest location or email [psti-info@praxair.com](mailto:psti-info@praxair.com).

or visit [www.praxair.com/printing](http://www.praxair.com/printing) to learn more.

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