



# Praxair Printing Technology update

2020

In 1979, Praxair Surface Technologies created the anilox roll industry by producing the world's first laser-engraved ceramic roll. For more than a quarter century, printers and converters around the world have turned to Praxair for anilox rolls and coatings that fit their application and offer longer service life, reduced downtime and greater productivity.

## Praxair's laser engraved anilox rolls and sleeves are industry leaders

The high standards adopted by Praxair Surface Technologies in the field of producing anilox roll and sleeve engravings allow you to protect your reputation.

Only Praxair can perform all operations of the production process, including:

- Making our own coating powders and gases
- Developing our own coating technology and equipment
- Engraving and finishing in-house

We combine our knowledge acquired in numerous fields of high technology industries, such as aerospace, oil exploration and energy, to make our engraving and coating techniques we have developed over the years available to you. The result is a high-precision and uncompromising engraving technique that guarantees optimal ink release.

## Support when and where you need it

One of the most important services provided by PST is the anilox audit. The technicians are available to inspect on site the specifications and conditions of the entire anilox fleet, generating a detailed report on the results that leads to a clear and complete picture of the condition of the drums and the quality of the cell with the relative ability to provide the correct print density. An audit can help

predetermine future purchase orders and provide a basis for subsequent inspections. Face to face and online seminars are available anytime.

Another key component of the Praxair technical service program is training in the care, cleaning and maintenance of anilox rolls. Technicians can train press room staff on proper cleaning and handling procedures for anilox rolls to prevent possible damage.



## Praxair ensures world-class superior quality

**Met Labs.** Only Praxair Surface Technologies places a metallurgical laboratory (Met Lab) at each of our Printing Industry Service Centers. Equipped with testing instrumentation and software, our labs allow our technicians to evaluate and certify every anilox roll or sleeve for coating thickness, hardness, line and screen count, coating adhesion, erosion and volume count—to the same high standard of quality everywhere in the world.

**Tech support.** Our Design Optimization Unit is more than technical support. We work with other suppliers (e.g., ink and plate suppliers) to ensure the entire operation is optimized and problems are resolved quickly.

**ISO certifications.** We have invested in our manufacturing facilities to ensure the highest

levels of quality in a safe environment. Our facilities are ISO 9001:2008 certified.



## Banded anilox roll

Its function is to create a zero point and highlight the limits and areas of greatest efficiency of the entire inking system.

PST representatives have extensive knowledge of the previously analyzed print data and can collaborate with customers and material suppliers by suggesting and developing accurate anilox roll specifications for any required printing or coating application.

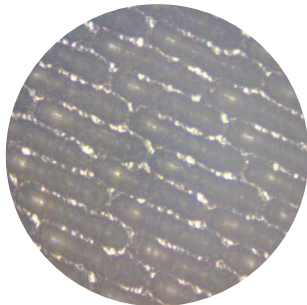
## Flexographic technical associations

Since the beginning, PST has collaborated, and currently collaborates, with flexographic associations present all over the world.

## The Novaline process

Novaline series engravings are obtained using the latest laser technology, where the beam is deflected and modulated at high speed to create a digital definition of each cell. The concept of every elongated cells is mainly the possibility of remaining in the correct screen / volume ratio compared to the traditional 60°. This will give the possibility to find the proper solution when the 60° standard cell is not enough.

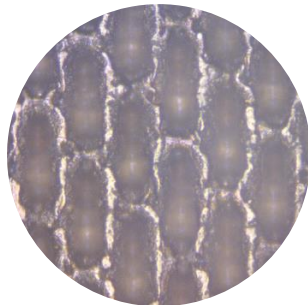
### NovaGold:



#### High definition for flexible packaging

- Angle suitable for any print mode.
- Excellent performance even on medium to low support performance media.
- Perfect for ultra-high-resolution full-color printing at high speed.
- Gentle angle of attack to the blade creates a very resistant and performing pattern.

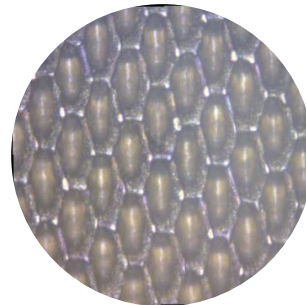
### NovaSilver:



#### High definition for paper and corrugated cardboard packaging

- Great efficiency and optimum performance on highly absorbent substrates.
- The straight and full-bodied walls maintain a very good stability over time.
- Improved ink release when using water-based inks.

### UVGold:

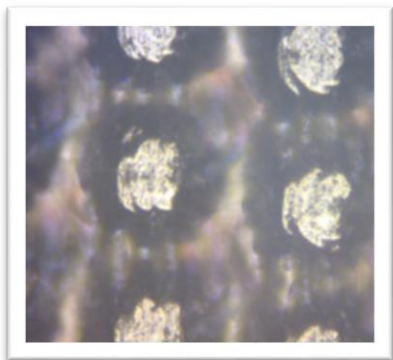


#### High definition for labels

- Very low ratio volume / cell depth.
- Suitable for highly viscous (UV) inks.
- Extremely easy to clean.

## ARTGold - Reverse Engraving Technology

During the first years of this third millennium, Praxair led the progress on open structure engraving with the introduction of reverse engraving technology.



The ARTGold engraving (Anilox Reverse Technologies) has a distinctive appearance due to the unusual configuration of the cells. The raised "pin" between the cells supports the doctor blade and provides a premium surface for placing ink or coating.

It has exceptional uniformity of coverage by virtually eliminating pitting and possibly the need for a double print bump.

Initially designed for flexo printing, it has become a standard for offset coating and for laying water-based and UV adhesives and coatings. It is perfect for high opacity white ink.

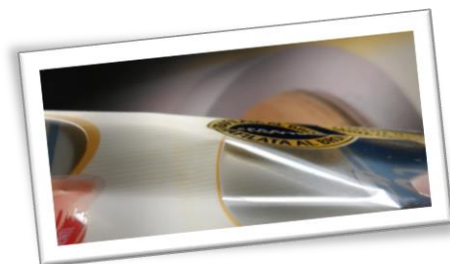
The cell bottom of the standard 60° cells tends to trap inks, coatings or adhesives, but with ARTGold this problem is effectively eliminated, allowing a high cleaning capacity. The obtainable transport volume is much greater than the standard. With the same screen ruling, depending on the printing conditions, it can be almost doubled.

### Tactile experiences

The market continues to grow, and tactile coatings are now used daily to provide customers with a finish that can be defined as sandy, which creates the opportunity to create surface effects, combining the gloss and opacity of the printed product.

Since the 90's, PST has been collaborating with the major ink manufacturers to supply the correct anilox specification.

The ARTGold model exhibits splendid stability and distribution with one- and two-component paints and across different viscosities.



The typical flat bottom of the engraving is very easy to clean allowing long printing sessions, while maintaining the tactile sensation along the reel.

# The specification selection

## METRIC Cm<sup>3</sup>/m<sup>2</sup>

What to print		Four - Seven color Process																			
		Degradation Halftones																			
Plate screen <b>L/cm</b>		Lines, work & Text																			
		Heavy solids																			
Anilox Screen		<b>L/cm</b>																			
Nova		NOVA MAX																			
60°		MAX																			
60° Optimum RATIO		33%																			
		23%																			
60°		MIN																			
Nova		MIN																			
Market segment		Corrugated										ARTGold									
		Label										NovaSilver									
		Flexo										60° ISF									
		Coating /Varnish Offset /Adhesive										60° SLR									
		Tactile varnish										Nova UVG									
		ARTGold - TIFFGold										Nova Gold									
		ARTGold																			

## IMPERIAL BCM

What to print		Four - Seven color Process																			
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		Tactile varnish										Nova UVG									
		ARTGold - TIFFGold										Nova Gold									
		ARTGold																			

# INK Spitting - The problem and the solution

Due to the inherently viscous nature of UV inks (being as much as five times that of the water base ink types), within the transfer zone of the press, high hydraulic forces are being applied to the doctor blade.

The thicker UV ink creates a hydroplaning effect that lifts the doctor blade a very small amount and causes "extra" to come through under that portion of the blade and transfer to the plate.

This excessive ink then prematurely releases from the plate, especially at higher press speeds, and results in what can be a very troublesome print defect. It has also been reported that contamination in the ink or if the ink wasn't ground properly and small amounts of pigment migrate underneath the doctor blade, this can create the opportunity for poor blade metering and an uneven ink film thus leading to potential ink spitting.

## About labels in contact with Food

The Framework Regulation, which regulates all food-contact materials placed on the EU market, establishes, among other provisions, a general safety requirement, and specifies that food-contact materials and articles must be manufactured in accordance with GMP (Good Manufacturing Practices) so that they do not transfer their constituents to foodstuffs in quantities that could endanger human health or bring about an unacceptable change in the composition of the food or its organoleptic properties.

This brings the ink suppliers to the LOW MIGRATION INKS.

## About labels with no contact to foods

Specific requirements for printing inks applied on the non-food contact side of materials and articles are detailed in the Annex to the GMP Regulation.

These requirements include, for example, a prohibition on unsafe levels of components of these inks transferring by set off or otherwise to the food-contact side.

This brings the ink suppliers to change the standard formulas of the UV inks



Tests conducted on various printing machines have led to:

- Excellent stability on the open inking system and on chambered inking systems.
- Great resistance against minor mechanical misalignments of inking systems.
- Possibility of engraving any type of pattern (having tackled the problem upstream, the type of engraving is irrelevant to the problem).
- Possibility to reach higher printing speed with different types of inks.

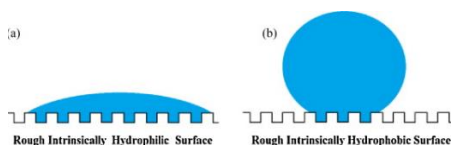
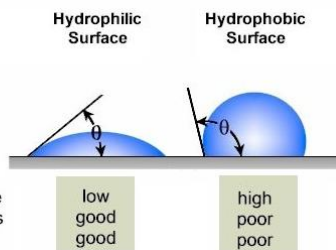
## The solution

Praxair Surface Technologies is a company that specializes in surface coatings, and independently produces powders, gases, and coating equipment.

Through the American laboratories of Indianapolis, it has decided to tackle the problem upstream, aiming at a highly functional hydrophilic ceramic coating against the described phenomenon.

The structure has been defined as NOAH and was developed based on operating environments, combining:

- Material science engineering
- Advanced coating technology
- Post-coating operations
- Highly reduced surface tension with optimal hydrophilic coating performance



## URMI™ Liquid Volume Measurement System

The anilox roll's primary function is to deliver a precise, uniform wet ink film thickness to a printing plate. The accuracy of this ink film thickness is dependent upon accurately identifying the volume of the engraving. To determine the ink-carrying cell volume, Praxair developed a unique liquid volume measurement tool—the URMI™ system

The volumetric unit measurement of the anilox ( $\text{cm}^3 / \text{m}^2$ ) was born together with the measuring methodology of the unit itself in the mid-80's in the plants that saw the ceramic anilox born – those of Praxair Surface Technologies. The ink measurement method developed by Praxair allowed, and still allows, users to correlate the amount of ink that the cell of the anilox roller can transfer to any support.

These initial analyzes carried out in Europe, led to the definition of the unit of measurement still in place. In fact, analyzing the symbol we can see the division between the volume expressed in  $\text{cm}^3$  and an area expressed in  $\text{m}^2$ .

This measurement unit has been chosen, difficult and scarce from an engineering point of view, because it is the one that practically best represents and correlates the shape of the cell to the quantity of ink that it can transfer.

### URMI System Simulates Ink Metering Process

The URMI volume measurement system closely simulates the actual ink metering process. Testing procedures involve placing a measured amount of ink on a portion of the engraving to be tested, spreading that ink with a doctor blade until the volume has uniformly filled a specified number of adjacent cells, transferring the ink to a piece of paper as an image. The image is then analyzed to determine its area. As the volume of ink that created the image area is known, the volume per square inch (or volume per square meter depending on your measuring system) is easily calculated by dividing the ink volume by the area of the cells covered.

### Using the URMI System (step-by-step instructions)

The accuracy of the URMI system is dependent upon the consistent depositing

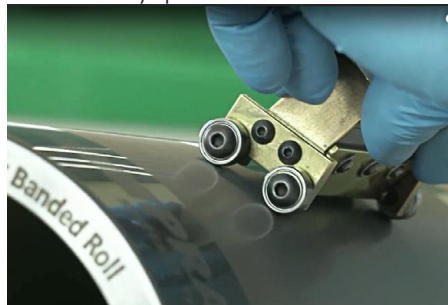
and spreading of a known quantity of ink, as well as the accurate measurement of the resulting spread area. In order to maintain accuracy, the following procedures should be utilized.

1. Prior to taking any measurements, the anilox roll must be cleaned with distilled or tap water and wiped dry to prepare the surface for the ink application.

2. A positive-displacement pipette, a high precision pharmaceutical tool used for reliably measuring, dosing, transferring, dispensing and injecting liquids in a large number of applications (i.e. life sciences - such as biotechnology and molecular biology - medicine, chemistry, pharmacology, etc.), is included with the URMI system kit. It is used to deliver the ink to the roll surface. The pipette should be calibrated to dispense the desired quantity of ink.



3. Once ink has been applied to the roll surface, the URMI tractor assembly, containing a clean-edged doctor blade, is used to evenly spread the ink.



4. Electrostatic copy paper is then placed against the roll and rubbed over the ink area. When the paper is removed, the ink will have transferred to the paper in a pattern representing the inked surface area. Clean the roll.



5. Calculating roll volume is done with the URMI app, a mobile phone application that can measure the area and immediately calculate the volume. It gives immediate, useful information that is easily sharable with the entire printing team through the common message services.



### URMI System and Anilox Roll Audits

Proper training is critical to successful use of the URMI liquid volume measurement system. Different operators will utilize varying techniques for using the equipment, and in order to guarantee accurate readings, training is essential.

Praxair can provide the necessary training through a complimentary Anilox Roll Audit, a service that educates you on how to perform regular inspections of your anilox roll inventory. These inspections can determine both the specifications and condition of all rolls currently in use and can assist in determining when a roll needs to be replaced or refurbished.

Praxair's Technical Sales personnel can provide roll audit and URMI training at any of our plant locations or on-site at your facility. During training, pressroom personnel will be shown how to perform roll audits and to accurately use the URMI volume measurement system.

# SLR - ONE MORE WEAPON AGAINST SCORING LINES

The very fine lines on the anilox defined by the flexographic community as a score line are a nightmare for all printers. They immediately appear on the printed product and are difficult to remove.

Extensive studies have shown that the causes are various and of different origins, as shown in the fishbone diagram below.

At the conclusion of our development project, the R & D division of the Printing Praxair Surface Technologies developed a highly resistant and high-performance product against this phenomenon.

The union of a compact and resistant ceramic coating, with a special set of the latest laser engraving technology process, allowed the creation of a highly resistant product to the score lines phenomenon, the Praxair Anilox product called SLR (Score Line Resistant).

The resistance tests carried out at many flexographic printers confirmed the excellent performance of the new SLR product.

The new technology is part of the standard 60° engraving, so it does not require any transfer tests and does not require changes in the printing machine setting.

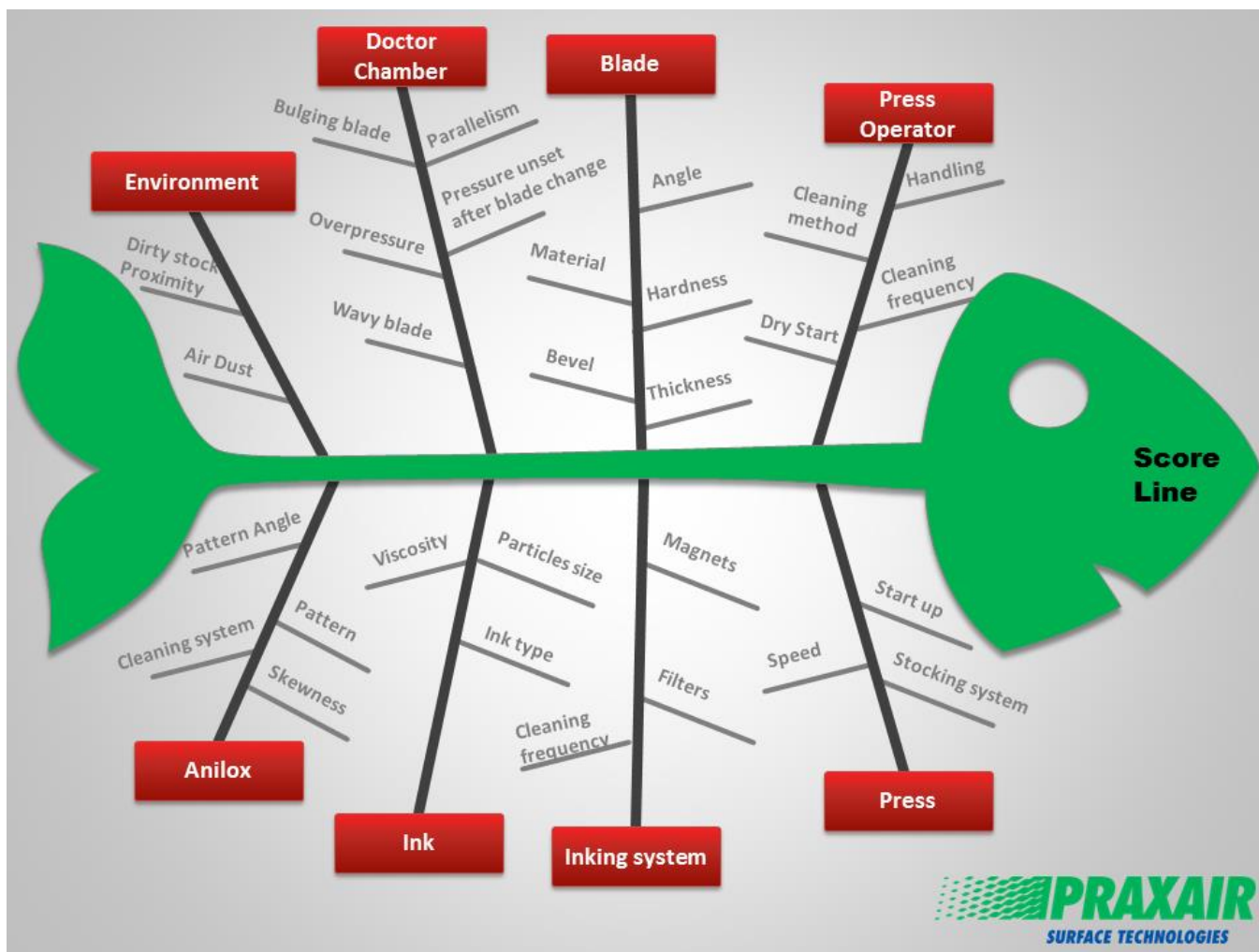
**Migration to SLR is simple and immediate.**

Praxair's printing services are present in five plants worldwide and the SLR product is available at each one.

Praxair technicians are available to provide additional information over this new product

# SLR

Score Line Resistant

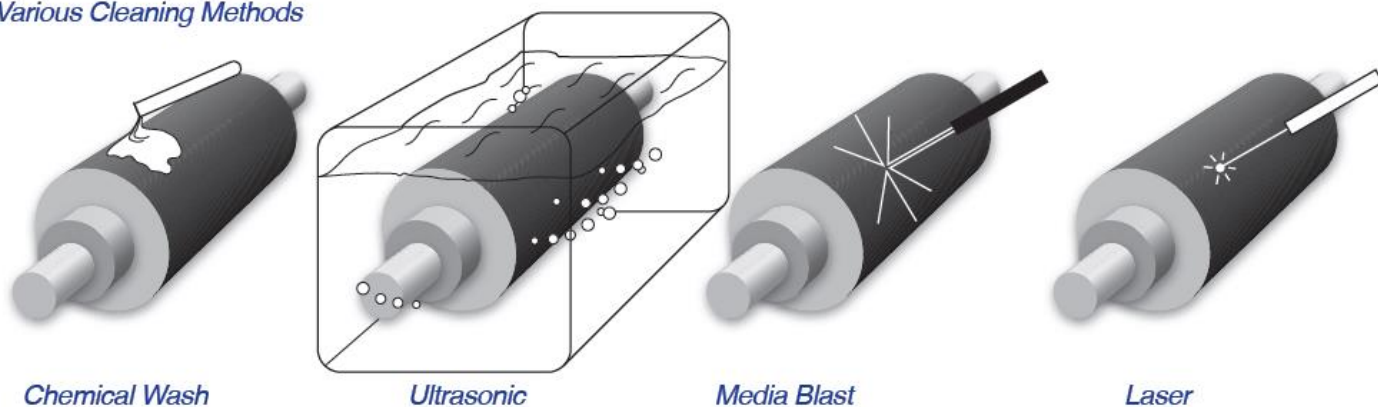


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## Anilox roll cleaning systems

### Various Cleaning Methods



If the cells of Praxair Surface Technologies' laser engraved ceramic anilox rolls become clogged with dirt, dried ink, or coatings, print quality is affected. In normal use, laser engraved anilox rolls must be cleaned as soon as possible after the completion of a press run to remove residual ink/coatings. All too often, a delay or interruption in the cleaning process may cause an anilox roll to become ineffective due to build-up of dried deposits in the cells. The build-up reduces the roll's ability to carry the proper amount of ink/coating. When this occurs, a method of effectively removing unwanted deposits and restoring cell volume is needed.

### Cleaning Methods

Any method used to clean the engraved coating must penetrate the depth of the microscopic cells in the hard-ceramic coating that gives the roll its long life. Solids from ink pigments, varnish, etc. deposited in the bottom of each cell must be dislodged and carried away. A satisfactory cleaning method must do this without damaging the cell walls and the ceramic surface, so a balance between cleaning aggressively to remove deposits quickly and protecting the integrity of the roll's surface must be achieved.

### Chemical Wash

Chemical wash anilox roll cleaning systems dissolve ink build-up in anilox cells using a caustic cleaning fluid wash followed by high pressure water spray. These processes clean by softening the ink/varnish deposits chemically, then by dislodging them with the force of the rinse. They do not use abrasives and they are advertised as preserving the integrity of the roll's surface. Because these systems use fluids, they are not size limited in the ability to penetrate high screencount anilox rolls up to 400Lpcm (1000Lpi). The roll is placed in a closed tank where it is rotated and flooded with a heated cleaning fluid that is applied, recirculated, and filtered. When this wash cycle is completed, a high-pressure water spray travels the length of the rotating roll and removes the residue from the cleaning solution and the dissolved inks. The cleaning process is completed by drying with compressed air.

Because there is a potential disposal problem with the effluent from this process, it is important that these systems include provisions for separating the effluent from the removed deposits and cleaning solution into flushable wastewater, and solid sludge for appropriate disposal.

### Media Blast

The method includes directing at a high-speed spherical blasting media, through compressed air, against the anilox surface to clean.

The media to be used must be softer than the ceramic coating so as to not damage the engraved cells.

The media itself must consist of particles small enough to fit into anilox cells. Usually the dimensions of the media used are small enough to work up to 260Lpcm (660Lpi).

Blasting results can be manipulated by length of exposure to blasting, or adjustment of pressure, nozzle size and nozzle distance so, the keys elements for successful operation of any media blast system include:

- Nozzle standoff distance. Must remain constant for even cleaning effect over the entire engraved surface.
- Nozzle angle must be 90 degrees to the roll surface. This will direct its media into the cells and not against the sides of the cells where it can damage the cell walls.
- Dwell time must be rigidly controlled by nozzle travel and roll rotation speeds. Careful control of nozzle movement is necessary to ensure the process does not linger in one area long enough to cause engraving damage.
- Air pressure must be only as intense as required for successful cleaning. Excessive pressure may cause the media stream to be too aggressive and attack the engraved surface.

Over time, repeated exposure to the media blasting action may cause cell walls to show signs of deterioration.

### Ultrasonic Cleaning

Available as a service or as equipment for inhouse use, ultrasonic cleaning systems are effective for cleaning Laser Engraved Ceramic Anilox Rolls – even those with high screen counts – but operating procedures vary greatly with the size of the roll, the characteristics of the engraving, and the design characteristics of the cleaning equipment. For example, as the screen count increases, cell wall thickness decreases, and the engraving is more susceptible to cell damage from prolonged exposure to some elements of this process. Ultrasonic cleaning procedures tailored to the specific equipment being used and the roll being cleaned must be carefully defined and followed to prevent damage to the engraved cell structure on the roll surface.

The ultrasonic cleaning cycle uses sound waves to produce cavitation - the formation of microscopic gas or vapor filled bubbles by mechanical means. These bubbles are under pressure and implode when they contact the surface of the roll. The energy released at the implosion point will result in an agitation, or scrubbing action, of great intensity that dislodges material from the roll surface. This agitation by many small and intense imploding bubbles scrubs both exposed and hidden surfaces of parts immersed in the solution carrying the ultrasonic waves. Only cleaning solutions designated for specific equipment cycles, and for cleaning laser engraved ceramic anilox rolls should be used. Operating temperatures must be limited to those recommended by the ultrasonic cleaning equipment manufacturer. Cleaning time is critical, the longer an engraved coating is exposed to ultrasonic cavitation the more it is likely to be damaged.



### Laser Cleaning - The contact free cleaning

Anilox laser cleaning is a more modern way of cleaning anilox rolls and is rapidly replacing the traditional methods such as media blast, ultrasonic, and chemical wash. The contact-free laser provides a cleaning without any mechanical, chemical, or unhealthy thermal load on the anilox.

The laser beam is directed to the anilox surface and the pulse's output power are controlled in a way that protects the ceramic layer and the engraved cells. The pulses are tuned to evaporate the material trapped in the anilox cells and can act against dried inks, adhesives, waxes, silicones, Teflon, and others.

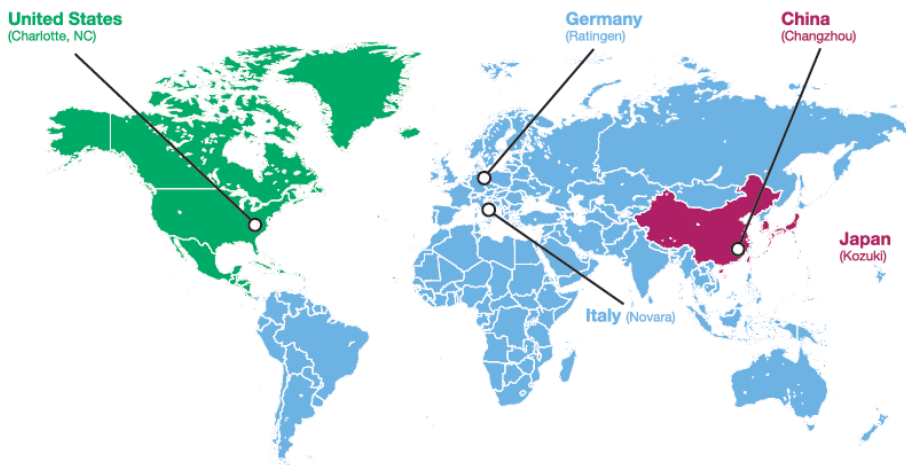
This non-contact and non-abrasive method only expose the elements that are clogged over the substrate that are vaporized and come off as dust particles easily to be collected.

There are no screen count limitations as this system can work up to 800Lpcm (2000Lpi). The PST Novara facility offers a complete evaluation service for your anilox pool. The rollers are inspected, laser cleaned, and certified as per a new anilox. Only anilox suppliers can assure a quality result, so please contact our sales team for a cleaning service quotation.



### PRAXAIR ADVICE

Due to the actual technology based on high screencount with high volumes and consequently deep cell with finer walls, PST advises the laser cleaning as the preferred method to avoid any broken walls on the engraved pattern.



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