

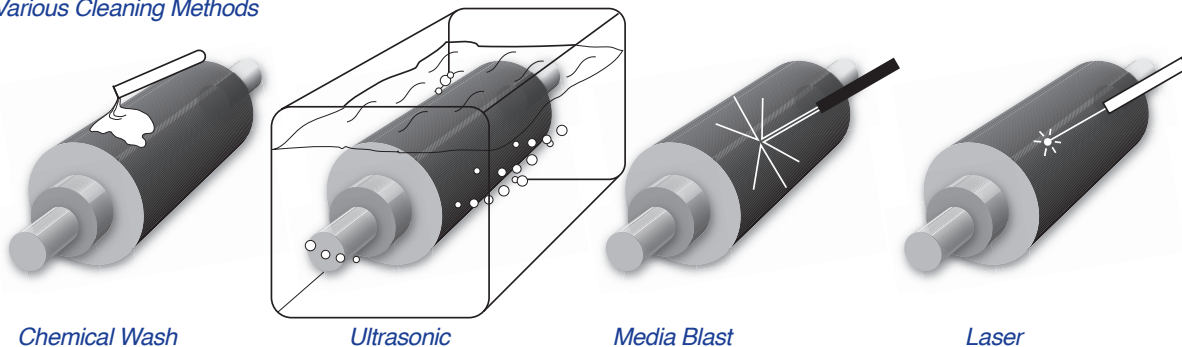
Ceramic Anilox Roll Cleaning Systems

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.

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.

Various Cleaning Methods



This Hard Facts looks at some of the cleaning systems that are used to restore the ink-carrying capacity of a laser engraved ceramic anilox roll, by removing deposits that are clogging/plugging the roll's cell structure.

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.

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 highspeed spherical blasting media, through compressed air, against the anilox surface to clean. The media to be used must be softer than the ceramic coating on a way 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. These are not cleaning methods to be used daily on the same roll surface, but they can be used in a regular maintenance program as a supplement to routine press-side cleaning, or to restore plugged engraving to its original cell volume.

Here below some media blast systems:

Baking Soda Systems use a specially formulated baking soda powder as an abrasive media. This material is gentle on the roll surface and is available in particle sizes small enough to work up to 300Lpcm (760Lpi).

It is a non-hazardous, non-toxic media and can be a quick and effective roll cleaner. The media is typically propelled by air pressures less than 3 bar (40 psi), a level that is also friendly to the engraved surface.

Cryogenic Systems use liquid carbon dioxide to produce solid CO2 pellets (dry ice) that are then used as a blast media and sprayed from a nozzle using air pressure of 5.5-7 bar (80-100 psi). The solid dry ice particles are not small enough to penetrate any cells. This system is too aggressive, the impact produces significant cell damage.

Plastic Pellet blast media use polyethylene plastic media sprayed by a pressure of approximately 4 bar (60 psi). Plastic powder media can be reused through multiple cycles. Because the media is reused, it is important to remove all grease and wet ink from the roll prior to installation in the system. This prevents these materials from contaminating the media used for future cycles. Due to the blast media dimension, this system is occasional plugging the cells beyond 400Lpcm (1000Lpi).

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 engraved on the surface of an anilox roll 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.

Because of the characteristics of modern water-based inks, many ultrasonic cleaner manufacturers employ an extensive presoak cycle to soften the hardened deposits that typically plug the engraved cells prior to ultrasonic cleaning. This step is considered essential to cleaning without damaging the engraved substrate material and frequently comprises 80 - 90% of the total cleaning time. The presoak cycle utilizes specially formulated – and sometimes proprietary – cleaning solutions with a very high pH to loosen deposits (too high PH can damage the ceramic). The design of most ultrasonic cleaning systems requires constantly rotating the roll while ultrasonic cleaning is underway and either total or partial immersion of the roll in cleaning solution.

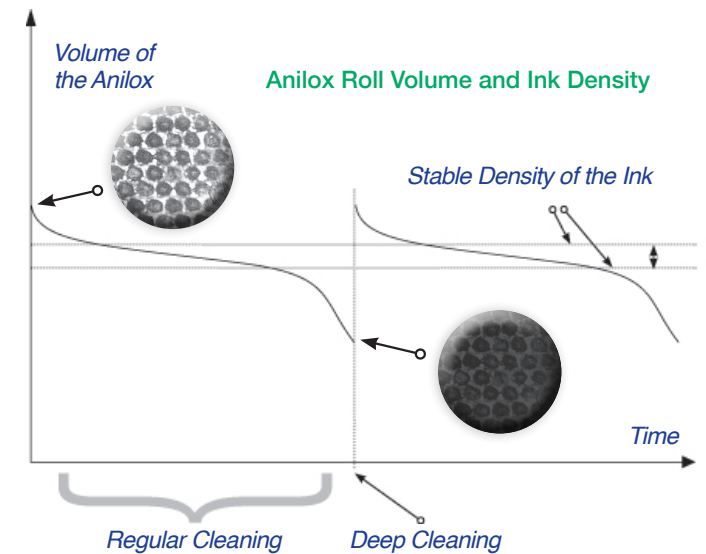
The ultrasonic cleaning cycle uses sound waves to produce cavitation - the formation of microscopic gas or vapor filled bubbles by mechanical means. These bubbles are under pressure and implode when they contact the surface of the roll. The energy released at the implosion point will result in an agitation, 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.

Careful balance of the following factors is required to control cavitation intensity in a manner that will confine this process to the deposits and protect the roll coating:

- Ultrasonic power directly affects cavitation intensity. Previous recommendations of a maximum ultrasonic power rating are probably not practicable with today's wide range of equipment that includes large tanks for total immersion of wide-web rolls and smaller trays for only partial immersion of narrow web rolls. The important consideration for the application of power levels is to follow the recommendations of the equipment manufacturer for a specific process.
- Ultrasonic frequency has an inverse relationship to cavitation intensity. As the frequency increases, bubble size is reduced, as is intensity. As a guideline, a minimum frequency of 40 kilohertz (40,000 cycles/sec.) is recommended to minimize intensity and create bubbles of a size that will allow them to fit into the engraved cells where they can then dislodge deposits at the bottom of the cell. However, here again this value is not absolute.

The process design of an individual piece of equipment may employ a different frequency.

- The temperature of the cleaning solution greatly effects cavitation intensity. Elevated temperatures reduce the viscosity of the cleaning solution and increase intensity, while heating is essential to the effectiveness of most cleaning solutions. Cleaning solution temperatures are normally maintained between 50°C - 60°C (120°F - 140°F). 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. Many ultrasonic cleaners that employ a presoak cycle now recommend ultrasonic cleaning cycles of 5 minutes duration, or less, to ensure monitoring and protect the roll's engraved surface from substrate damage. If a roll is exposed to ultrasonic energy for long intervals, damage to the engraved cells could result. Here again, this value is not absolute. The process design of an individual piece of equipment may require a different cleaning time.

Laser 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 (dried inks, adhesives, waxes, silicones, Teflon, plate materials) 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).

Note: The content of this publication is intended for information and further investigation only. Praxair Surface Technologies neither endorses nor recommends any of the processes or companies that offer the products or services and cannot guarantee results. The user must assume responsibility for any and all results and damages.

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