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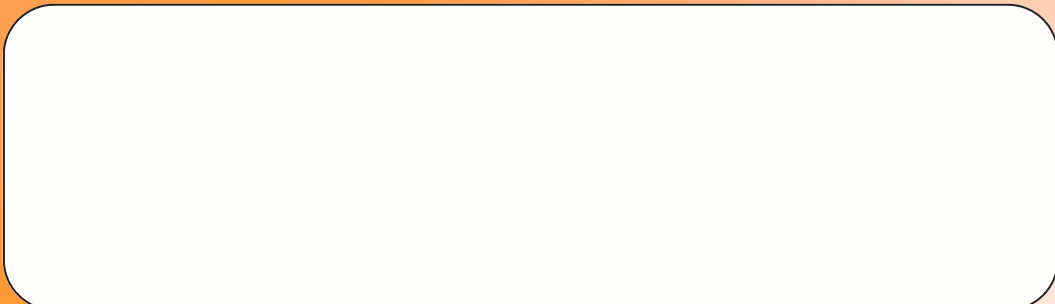


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Thomaston, CT

Part 3 ELECTROLESS PLATING and CLEANING

Beside telling readers about UniMetal it also was created to give anyone in Procurement a better understanding of Plating & Surface Finishing processes.



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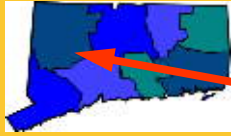
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UNIMETAL SURFACE FINISHING, LLC

Thomaston, CT

READERS: *This is the third installment of a Spotlight Feature Story featuring UniMetal Surface Finishing, LLC, with an educational slant to help procurement readers and job shop owners gain an overview of metal finishing. This third installment will cover some of the processes offered by UniMetal. If you need to review the first or second installments, we can send you an e-version of them. Contact us at gatewaybill@yahoo.com*

CLEANING, ULTRASONIC, DEGREASING

Precision cleaning is the cleaning of metal components of oil, residual metal particles and debris to a qualitative and quantifiable specification. The cleanliness specification is established by customer standards and/or referenced to an Automotive or other recognized standard.

The precision cleaning process is certified through periodic white room laboratory analysis of residual contaminants and particles by size, weight or count by the processing vendor to follow all established procedures to maintain the controls on the process and quality standards.

UniMetal currently has 4 self-contained Ransohoff & Jenfab precision cleaning machines designed specifically to maintain an enclosed controlled environment for the purpose of eliminating the possible contamination of the components through outside sources.

UniMetal recently made a major investment in a new state of the art fully automated Roll parts vacuum washing machine. This cleaning machine utilizes both spray and immersion technologies. They are used to clean parts in products ranging from automotive, screw machine, cold headed, to final cleaning for munitions.

It utilizes alkaline, aqueous and vacuum degreasing mediums to attain exacting cleanliness specifications as well as cosmetic cleaning. It gives positive assurance for uses in medical applications, military, automotive and aerospace.



This is the new fully automated Roll vacuum washing machine. A major investment with spectacular results.

UniMetal also offers Ultrasonic precision cleaning. Parts can be programmed for ultrasonic irradiation while submersed. This facilitates the removal of impurities in difficult to reach recessed areas. The cleaning cycles are timed through the computer controller based on the amount it takes to achieve the desired results of cleanliness.



Small lot Ultrasonic vapor degreasing and cleaning is also offered.



When the customer's parts exit the Roll cleaning machine they are super clean. The parts are re-loaded back into the customer's container which is lined with a plastic bag to maintain part cleanliness.

There are many companies who send their parts to Unimetal just for the cleaning their equipment offers.

METAL FINISHING

Deburring is an abrasive industrial process by which large lots of parts or components made from metal or other materials can be economically processed in bulk to achieve one or several of a variety of surface effects. Desired results include: burr removal, descaling, smoothing, edge-break, radius formation, pre-plate, pre-paint surface preparation, removal of surface oxidations from heat treat or other processes, surface finishing, polishing, developing microfinishes, rust

Continued on page 7



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A large vibration tumbler and the operator separating customer parts from the media. Just one of several choices of how to produce the best parts possible.

removal. The methods UniMetal offers are: barrel tumbling, vibratory, dry tumbling, bright dip (Acid), sand blast, media mass finishing.



There are 30 of these oblique tumble clean barrels in various sizes. Used with water produces a hand buffed appearance and can work well even on more delicate parts.



Using the correct media is what tumble deburring and polishing are all about. With advantages in wet or dry processing surface finishes are very predictable.

OXIDES AND PHOSPHATES

Black Oxide

Black oxide or blackening is a conversion coating for ferrous materials, stainless steel, copper and copper based alloys, zinc, powdered metals, and silver solder. It is used to add mild corrosion resistance, for appearance and to minimise light reflection. To achieve maximum corrosion resistance the black oxide must be impregnated with oil or wax.

Black Phosphate

Black Phosphate coating is a method used to protect the exterior steel surface from corrosion. It also adds some wear resistance because of the chemical phosphate coating. The process of phosphate coating is employed for the purpose of pretreatment prior to coating or painting, increasing corrosion protection and improving friction properties of sliding components. In other instances, phosphate coatings are applied to threaded parts and top coated with oil (P&O or pickled and oiled) to add anti-galling and rust inhibiting characteristics.

The phosphating process relies on the basic pickling reaction that occurs on the metal substrate when the process solution comes in contact with the metal. The main benefits that phosphating provides is strong adhesion and corrosion protection. Typically, phosphate coatings are used on steel parts but can also be used on aluminum.

Zinc phosphate is available and is used for rust proofing ferrous metals. It can be applied either by immersion or spraying. Zinc phosphate is an alternative to manganese phosphate, while providing resistance to harsh elements that tend to wear products quickly.

PASSIVATION

Passivation remains a critical step in maximizing the essential corrosion resistance of parts and components machined from stainless steels. It can make the difference between satisfactory performance and premature failure. Incorrectly performed, passivation can actually induce corrosion.

Passivation is a post-fabrication method of maximizing the inherent corrosion resistance of the stainless alloy from which the workpiece was produced. It is not a scale removal treatment, nor is it like a coat of paint.

Passivation is a process that uses an acid (nitric or citric acid) solution to remove the surface iron and other contaminants that cause corrosion in the Stainless Steel. Prior to entering the acid the parts are cleaned to remove any oil and organics. Through the entire

Continued on page 9



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Wilfredo Cancel, Supervisor, processes medical components in this UniMetal Nadcap Certified for both the Citric and Nitric passivation process lines.

process an almost immeasurable amount of material is removed and leaves the chrome on the surface which oxidizes creating a very thin (less than .000001" thick) passive chrome oxide layer.

Advantages of passivation:

- Improved Corrosion Resistance
- Uniform, Smooth Appearance and Finish
- Deburring (Polished Surface)
- Cleanliness
- Improved and Extended Life of Product



This passivation equipment utilizes stainless steel locked cover baskets. It handles medium to delicate parts that are cleaned, passivated and dried in the baskets.

Citric Acid Type

- Removes free iron from the SST substrate...
- Achieves a passive surface
- Meets QQP-35C (replaced by ASTM A967 [AMS -QQ-P-35])
- Tested and approved by the aerospace, medical, machining/manufacturing, & food industries

- Brightens 300 series SST alloys
- Excellent appearance on 400 series SST
- Operates at a higher pH
- 3.0-3.2 for 400 series SST
- 4.5-5.0 for 300 series SST
- Lower metal removal rate
- 0.0010 mills/minute per surface (performed on 303 SST)
- Accepted as an alternative to nitric acid/sodium dichromate for AMS-QQ-P-35 Type II on 303 SST (less chance for pitting)

Nitric Acid Type

- Removes free iron from the SST substrate
- Achieves a passive surface
- Meets QQP-35C (replaced by ASTM A967 [AMS -QQ-P-35])
- Tested and approved by the aerospace, medical, machining/manufacturing & food industries
- Brightens 300 series SST alloys
- Not as bright of an appearance on 400 series SST
- Low operating pH <3.0 for all series of SST
- Higher metal removal rate 0.0028 mills/minute per surface (performed on 303 SST)

Specifications

- AMS-QQ-P-35 (Replaced QQ-P-35)
- AMS 2700
- ASTM A-380
- ASTM A-967
- ASTM F-86 (Titanium Components)

Passivation Testing

Water Immersion

Verifies the passivation process on all grades of stainless steel, with exception of 440C. After testing, specimens shall show no signs of rust or corrosion.

Copper Sulfate

Verifies the passivation of austenitic stainless steel in the 200 and 300 series conducted in accordance with MIL-STD-753 Method 102. The specimens shall show no signs of copper deposit.

Salt Spray

Performed in accordance with ASTM B117 for 2 hours, when specified by engineering drawings. After testing, specimens shall show no signs of rust, stain or corrosion.

ELECTROLESS NICKEL PLATING

Electroless Nickel plating is essentially the process of producing a uniform thickness, metallic layer on all exposed surfaces using an autocatalytic bath.

Electroless Nickel plating is unique from other plating methods because it does not require any

Continued on page 11



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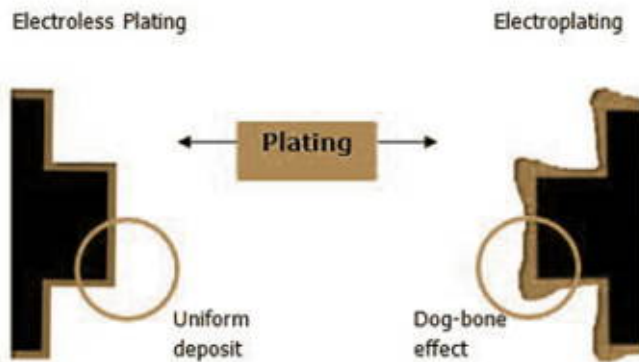
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electrical current that causes the transfer of nickel to the part, or parts. The baths are completely autocatalytic in nature. Because of this they do not have to be concerned with high and low current density areas. When a part is submerged in the plating solution the part will plate at the same rate anywhere on the part's surface. (A good rule of thumb for a mid-phos EN is that it will deposit .0007" in one hour.)

Besides the uniformity of the deposit, Electroless Nickel also has many other characteristics that can be used for engineering purposes such as ductility, lubricity, corrosion resistance, wear and abrasion resistance as well as solder ability and hardness.



A major benefit in the electroless process is that unlike most plating processes there is no build up related to the shape of the part. Thus, a sharp edge receives the same thickness of deposits, as does a blind hole.

The characteristics listed above can be altered by altering the phosphorous content. For example high and low phosphorous deposits have a much higher corrosion resistance than a mid-phosphorous bath.

There are five basic standards offered by UniMetal.

- AMS 2404C, Electroless Nickel Plating
- AMS 2405B, Electroless Nickel Plating, Low Phosphorus
- ASTM B656, Standard Guide for Autocatalytic Nickel-Phosphorus
- ASTM B733, Standard Specification for Autocatalytic (Electroless) Nickel-Phosphorus
- The MIL-C-26074 was waived in favor of the AMS 2404.

These characteristic are very important in the design of metallic products and their functional uses. The coatings are alloys of nickel and phosphorus produced by autocatalytic chemical reduction using hypophosphite salt. Because the deposited nickel alloy

is a catalyst for the reaction, the process is self-sustaining. The chemical and physical properties of the deposit vary primarily with its phosphorus content and subsequent heat treatment (ASTM B733-04).

Other properties benefits available.

- Abrasion
- Electrical conductivity provide diffusion barrier
- Hardness
- Heat hardenability
- Magnetism
- Solderability.
- Wear and corrosion resistance

Other areas of use with Electroless Nickel Plating

Electroless Nickel Types	PH Content	Common Use
Very low phosphorus	1-3%	Applications requiring abrasion and wear resistance.
Low phosphorus	3-6%	Electronic applications, solderability, bondability, increased electrical conductivity, and resistance to strong alkali solutions.
Mid phosphorus	6-9%	To meet the general purpose requirements of wear and corrosion resistance.
High phosphorus	9-12%	On beryllium and titanium parts for low stress properties.

Plastic Plating with Alkaline Nickel-Phosphorus

Using low phosphorus content deposited 3 to 4%, the Alkaline Nickel-P is plated at moderately low temperature, making them suitable for plating on plastics and to many applications in the electronics industry, where good solderability is required.

Nickel-Boron Baths

Nickel-boron baths are normally formulated using an *amine borane* as the chemical reducing agent. Alloy deposits can be plated from acid or alkaline baths. Is often used in electronic applications to provide specific harder deposit and also produce a high electrical conductivity layer.

Types of Nickel-Boron Baths:

- Low-boron-containing baths (< 1% B)
- High-boron-containing baths (2 to 3% B)

Polyalloys

Solutions deposits having three or four elements designed to maximize qualities such as corrosion

Continued on Page 13



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- Nickel-tungsten-phosphorus
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- Nickel-cobalt-phosphorus
- Nickel-molybdenum-boron
- Nickel-tungsten-boron

Salvage or Restoration Using Electroless Nickel

Electroless Nickel can also be used for the restoration of worn pieces or salvage of undersized (mis-machined) parts.



Sharp corners, delicate features are enhanced with electroless nickel plating.



Next month's installment will pick up with PRECIOUS METALS



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CNC TURNING MULTI-AXIS MACHINING



Is he longsome

Could be 2017 just as well as '52', and is often not he, but she.....

Or just blind--

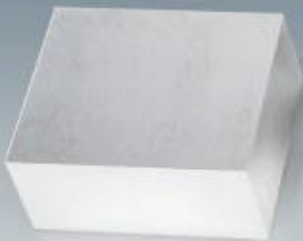
This guy who drives

So close behind?

Burma Shave

Machine-Ready Solutions™

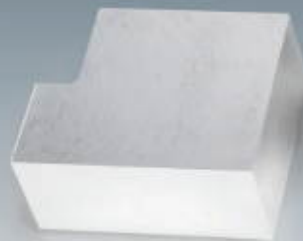
Rethink Your Workflow—Reduce Cycle Time



Machine-Ready Blanks
 Made to order from one to thousands, close tolerance and ready to load directly into your CNC machining center.



Machine-Ready Dovetail Blanks
 Dovetail Blanks include a precision dovetail to match your brand and model of workholding fixture.



Machine-Ready Material Prep
 Squaring, flattening and milling, including adding features and removing large amounts of material—your stock or ours.



Finish-Machined Components
 Complete-to-print finish components, including processing, sub-assembly and managed inventory.

Machine-Ready is Lean-Ready

Being Machine-Ready lets you get right to the high value process of finish-machining, by eliminating material prep and other time consuming processes. Choose the Machine-Ready Solution that best supports your busy shop and start increasing throughput, now.



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This road sign posted in 1952