

Washing (Finished Products) involves cleaning finished metal products after use or storage using fresh water or water containing a mild cleaning solution. This unit operation applies only to the finished products that do not require maintenance or rebuilding.

Welding involves joining two or more pieces of material by applying heat, pressure, or both, with or without filler material, to produce a metallurgical bond through fusion or recrystallization across the interface. This includes gas welding, resistance welding, arc welding, cold welding, electron beam welding, and laser beam welding. Welding typically is a dry process, except for the occasional use of contact cooling waters or rinses.

Wet Air Pollution Control for Organic Constituents involves using water to remove organic constituents that are entrained in air streams exhausted from process tanks or production areas. Most frequently, wet air pollution control devices are used with cleaning and coating processes. A common type of wet air pollution control is the wet packed scrubber consisting of a spray chamber that is filled with packing material. Water is continuously sprayed onto the packing and the air stream is pulled through the packing by a fan. Pollutants in the air stream are absorbed by the water droplets and the air is released to the atmosphere. A single scrubber often serves numerous process tanks.

APPENDIX C TO PART 438—METAL-BEARING OPERATIONS DEFINITIONS

NOTE: The definitions in this appendix shall not be used to differentiate between the six "core" metal finishing operations (*i.e.*, Electroplating, Electroless Plating, Anodizing, Coating (chromating, phosphating, and coloring), Chemical Etching and Milling, and Printed Circuit Board Manufacture) and forty "ancillary" process operations listed at 40 CFR 433.10(a).

Abrasive Jet Machining includes removing stock material from a part by a high-speed stream of abrasive particles carried by a liquid or gas from a nozzle. Abrasive jet machining is used for deburring, drilling, and cutting thin sections of metal or composite material. Unlike abrasive blasting, this process operates at pressures of thousands of pounds per square inch. The liquid streams typically are alkaline or emulsified oil solutions, although water also can be used.

Acid Pickling Neutralization involves using a dilute alkaline solution to raise the pH of acid pickling rinse water that remains on the part after pickling. The wastewater from this operation is the acid pickling neutralization rinse water.

Acid Treatment With Chromium is a general term used to describe any application of an acid solution containing chromium to a

metal surface. Acid cleaning, chemical etching, and pickling are types of acid treatment. Chromic acid is used occasionally to clean cast iron, stainless steel, cadmium and aluminum, and bright dipping of copper and copper alloys. Also, chromic acid solutions can be used for the final step in acid cleaning phosphate conversion coating systems. Chemical conversion coatings formulated with chromic acid are defined as "Chromate Conversion Coating (or Chromating)" in this appendix. Wastewater generated during acid treatment includes spent solutions and rinse waters. Spent solutions typically are batch discharged and treated or disposed of off site. Most acid treatment operations are followed by a water rinse to remove residual acid.

Acid Treatment Without Chromium is a general term used to describe any application of an acid solution not containing chromium to a metal surface. Acid cleaning, chemical etching, and pickling are types of acid treatment. Wastewater generated during acid treatment includes spent solutions and rinse waters. Spent solutions typically are batch discharged and treated or disposed of off site. Most acid treatment operations are followed by a water rinse to remove residual acid.

Alcohol Cleaning involves removing dirt and residue material from a part using alcohol.

Alkaline Cleaning Neutralization involves using a dilute acid solution to lower the pH of alkaline cleaning rinse water that remains on the part after alkaline cleaning. Wastewater from this operation is the alkaline cleaning neutralization rinse water.

Alkaline Treatment With Cyanide is the cleaning of a metal surface with an alkaline solution containing cyanide. Wastewater generated during alkaline treatment includes spent solutions and rinse waters. Alkaline treatment solutions become contaminated from the introduction of soils and dissolution of the base metal. They usually are treated and disposed of on a batch basis. Alkaline treatment typically is followed by a water rinse that is discharged to a treatment system.

Anodizing With Chromium involves producing a protective oxide film on aluminum, magnesium, or other light metal, usually by passing an electric current through an electrolyte bath in which the metal is immersed. Anodizing may be followed by a sealant operation. Chromic acid anodic coatings have a relatively thick boundary layer and are more protective than are sulfuric acid coatings. For these reasons, chromic acid is sometimes used when the part cannot be rinsed completely. These oxide coatings provide corrosion protection, decorative surfaces, a base for painting and other coating processes, and special electrical and mechanical properties. Wastewaters generated during anodizing include spent anodizing solutions, sealants,

and rinse waters. Because of the anodic nature of the process, anodizing solutions become contaminated with the base metal being processed. These solutions eventually reach an intolerable concentration of dissolved metal and require treatment or disposal. Rinse water following anodizing, coloring, and sealing typically is discharged to a treatment system.

Anodizing Without Chromium involves applying a protective oxide film to aluminum, magnesium, or other light metal, usually by passing an electric current through an electrolyte bath in which the metal is immersed. Phosphoric acid, sulfuric acid, and boric acid are used in anodizing. Anodizing also may include sealant baths. These oxide coatings provide corrosion protection, decorative surfaces, a base for painting and other coating processes, and special electrical and mechanical properties. Wastewater generated during anodizing includes spent anodizing solutions, sealants, and rinse waters. Because of the anodic nature of the process, anodizing solutions become contaminated with the base metal being processed. These solutions eventually reach an intolerable concentration of dissolved metal and require treatment or disposal. Rinse water following anodizing, coloring, and sealing steps typically is discharged to a treatment system.

Carbon Black Deposition involves coating the inside of printed circuit board holes by dipping the circuit board into a tank that contains carbon black and potassium hydroxide. After excess solution dips from the circuit boards, they are heated to allow the carbon black to adhere to the board.

Catalyst Acid Pre-Dip uses rinse water to remove residual solution from a part after the part is processed in an acid bath. The wastewater generated in this unit operation is the rinse water.

Chemical Conversion Coating without Chromium is the process of applying a protective coating on the surface of a metal without using chromium. Such coatings are applied through phosphate conversion (except for "Iron Phosphate Conversion Coating," see appendix B of this part), metal coloring, or passivation. Coatings are applied to a base metal or previously deposited metal to increase corrosion protection and lubricity, prepare the surface for additional coatings, or formulate a special surface appearance. This unit process includes sealant operations that use additives other than chromium.

(1) In phosphate conversion, coatings are applied for one or more of the following reasons: to provide a base for paints and other organic coatings; to condition surfaces for cold forming operations by providing a base for drawing compounds and lubricants; to impart corrosion resistance to the metal surface; or to provide a suitable base for corrosion-resistant oils or waxes. Phosphate conversion coatings are formed by immersing a

metal part in a dilute solution of phosphoric acid, phosphate salts, and other reagents.

(2) Metal coloring by chemical conversion coating produces a large group of decorative finishes. Metal coloring includes the formation of oxide conversion coatings. In this operation, the metal surface is converted into an oxide or similar metallic compound, giving the part the desired color. The most common colored finishes are used on copper, steel, zinc, and cadmium.

(3) Passivation forms a protective coating on metals, particularly stainless steel, by immersing the part in an acid solution. Stainless steel is passivated to dissolve embedded iron particles and to form a thin oxide film on the surface of the metal. Wastewater generated during chemical conversion coating includes spent solutions and rinses (*i.e.*, both the chemical conversion coating solutions and post-treatment sealant solutions). These solutions commonly are discharged to a treatment system when contaminated with the base metal or other impurities. Rinsing normally follows each process step, except when a sealant dries on the part surface.

Chemical Milling (or Chemical Machining) involves removing metal from a part by controlled chemical attack, or etching, to produce desired shapes and dimensions. In chemical machining, a masking agent typically is applied to cover a portion of the part's surface; the exposed (unmasked) surface is then treated with the chemical machining solution. Wastewater generated during chemical machining includes spent solutions and rinses. Process solutions typically are discharged after becoming contaminated with the base metal. Rinsing normally follows chemical machining.

Chromate Conversion Coating (or Chromating) involves forming a conversion coating (protective coating) on a metal by immersing or spraying the metal with a hexavalent chromium compound solution to produce a hexavalent or trivalent chromium compound coating. This also is known as chromate treatment, and is most often applied to aluminum, zinc, cadmium or magnesium surfaces. Sealant operations using chromium also are included in this unit operation. Chromate solutions include two types: (1) those that deposit substantial chromate films on the substrate metal and are complete treatments themselves, and (2) those that seal or supplement oxide, phosphate, or other types of protective coatings. Wastewater generated during chromate conversion coating includes spent process solutions (*i.e.*, both the chromate conversion coating solutions and post-treatment sealant solutions) and rinses. These solutions typically are discharged to a treatment system when contaminated with the base metal or other impurities. Also, chromium-based solutions, which are typically formulated with

hexavalent chromium, lose operating strength when the hexavalent chromium reduces to trivalent chromium during use. Rinsing normally follows each process step, except for sealants that dry on the surface of the part.

Chromium Drag-out Destruction is a unit operation performed following chromium-bearing operations to reduce hexavalent chromium that is "dragged out" of the process bath. Parts are dipped in a solution of a chromium-reducing chemical (e.g., sodium metabisulfite) to prevent the hexavalent chromium from contaminating subsequent process baths. This operation typically is performed in a stagnant drag-out rinse tank that contains concentrated chromium-bearing wastewater.

Cyanide Drag-out Destruction involves dipping part in a cyanide oxidation solution (e.g., sodium hypochloride) to prevent cyanide that is "dragged out" of a process bath from contaminating subsequent process baths. This operation typically is performed in a stagnant drag-out rinse tank.

Cyaniding Rinse is generated during cyaniding hardening of a part. The part is heated in a molten salt solution containing cyanide. Wastewater is generated when excess cyanide salt solution is removed from the part in rinse water.

Electrochemical Machining is a process in which the part becomes the anode and a shaped cathode is the cutting tool. By pumping electrolyte between the electrodes and applying a current, metal is rapidly but selectively dissolved from the part. Wastewater generated during electrochemical machining includes spent electrolytes and rinses.

Electroless Catalyst Solution involves adding a catalyst just prior to an electroless plating operation to accelerate the plating operation.

Electroless Plating involves applying a metallic coating to a part using a chemical reduction process in the presence of a catalyst. An electric current is not used in this operation. The metal to be plated onto a part typically is held in solution at high concentrations using a chelating agent. This plates all areas of the part to a uniform thickness regardless of the configuration of the part. Also, an electroless-plated surface is dense and virtually nonporous. Copper and nickel electroless plating operations are the most common. Sealant operations (*i.e.*, other than hot water dips) following electroless plating are considered separate unit operations if they include any additives. Wastewater generated during electroless plating includes spent process solutions and rinses. The wastewater contains chelated metals, which require separate preliminary treatment to break the metal chelates prior to conventional chemical precipitation. Rinsing follows most electroless plating processes to

remove residual plating solution and prevent contamination of subsequent process baths.

Electrolytic Cleaning involves removing soil, scale, or surface oxides from a part by electrolysis. The part is one of the electrodes and the electrolyte is usually alkaline. Electrolytic alkaline cleaning and electrolytic acid cleaning are the two types of electrolytic cleaning.

(1) Electrolytic alkaline cleaning produces a cleaner surface than do nonelectrolytic methods of alkaline cleaning. This operation uses strong agitation, gas evolution in the solution, and oxidation-reduction reactions that occur during electrolysis. In addition, dirt particles become electrically charged and are repelled from the part surface.

(2) Electrolytic acid cleaning sometimes is used as a final cleaning before electroplating. Sulfuric acid is most frequently used as the electrolyte. As with electrolytic alkaline cleaning, the mechanical scrubbing effect from the evolution of gas enhances the effectiveness of the process.

Wastewater generated during electrolytic cleaning includes spent process solutions and rinses. Electrolytic cleaning solutions become contaminated during use due to the dissolution of the base metal and the introduction of pollutants. The solutions typically are batch discharged for treatment or disposal after they weaken. Rinsing following electrolytic cleaning removes residual cleaner to prevent contamination of subsequent process baths.

Electroplating with Chromium involves producing a chromium metal coating on a surface by electrodeposition. Electroplating provides corrosion protection, wear or erosion resistance, lubricity, electrical conductivity, or decoration. In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. Metal salts or oxides typically are added to replenish the solutions. Chromium trioxide often is added as a source of chromium. In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes with the metal being deposited, stabilizers to prevent hydrolysis, buffers for pH control, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties. Sealant operations performed after this operation are considered separate unit operations if they include any additives (*i.e.*, other than hot water dips). Wastewater generated during electroplating includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to the base metal dissolving and the introduction of other pollutants, diminishing the effectiveness of the electroplating solutions. Spent concentrated solutions typically are treated to

remove pollutants and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electroplating with Cyanide involves producing metal coatings on a surface by electrodeposition using cyanide. Electroplating provides corrosion protection, wear or erosion resistance, electrical conductivity, or decoration. In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. The metal ions in solution typically are replenished by dissolving metal from anodes contained in inert wire or metal baskets. Sealant operations performed after this operation are considered separate unit operations if they include any additives (*i.e.*, any sealant operations other than hot water dips). In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes with the metal being deposited, stabilizers to prevent hydrolysis, buffers to control pH, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties. Cyanide, usually in the form of sodium or potassium cyanide, frequently is used as a complexing agent for zinc, cadmium, copper, and precious metal baths. Wastewater generated during electroplating includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to dissolution of the base metal and the introduction of other pollutants, diminishing the performance of the electroplating solutions. Spent concentrated solutions typically are treated to remove pollutants and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electroplating without Chromium or Cyanide involves the production of metal coatings on a surface by electrodeposition, without using chromium or cyanide. Commonly electroplated metals include nickel, copper, tin/lead, gold, and zinc. Electroplating provides corrosion protection, wear or erosion resistance, lubricity, electrical conductivity, or decoration. In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. The metal ions in solution typically are replenished by dissolving metal from anodes contained in inert wire or metal baskets. Sealant operations performed after this operation are considered separate unit operations if they include any additives (*i.e.*, any sealant operations other than hot water dips). In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes

with the metal being deposited, stabilizers to prevent hydrolysis, buffers to control pH, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties. Wastewater generated during electroplating without chromium or cyanide includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to dissolution of the base metal and the introduction of other pollutants, diminishing the effectiveness of the electroplating solutions. Spent concentrated solutions typically are treated for pollutant removal and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electropolishing involves producing a highly polished surface on a part using reversed electrodeposition in which the anode (part) releases some metal ions into the electrolyte to reduce surface roughness. When current is applied, a polarized film forms on the metal surface, through which metal ions diffuse. In this operation, areas of surface roughness on parts serve as high-current density areas and are dissolved at rates greater than the rates for smoother portions of the metal surface. Metals are electropolished to improve appearance, reflectivity, and corrosion resistance. Base metals processed by electropolishing include aluminum, copper, zinc, low-alloy steel, and stainless steel. Common electrolytes include sodium hydroxide and combinations of sulfuric acid, phosphoric acid, and chromic acid. Wastewater generated during electropolishing includes spent process solutions and rinses. Eventually, the concentration of dissolved metals increases to the point where the process becomes ineffective. Typically, a portion of the bath is decanted and either fresh chemicals are added or the entire solution is discharged to treatment and replaced with fresh chemicals. Rinsing can involve several steps and can include hot immersion or spray rinses.

Galvanizing/Hot Dip Coating involves using various processes to coat an iron or steel surface with zinc. In hot dipping, a base metal is coated by dipping it into a tank that contains a molten metal.

Hot Dip Coating involves applying a metal coating (usually zinc) to the surface of a part by dipping the part in a molten metal bath. Wastewater is generated in this operation when residual metal coating solution is removed from the part in rinse water.

Kerfing uses a tool to remove small amounts of metal from a product surface. Water and synthetic coolants may be used to lubricate the area between the tool and the metal, to maintain the temperature of the cutting tool, and to remove metal fines from

the surface of the part. This operation generates oily wastewater that contains metal fines and dust.

Laminating involves applying a material to a substrate using heat and pressure.

Mechanical and Vapor Plating involves applying a metallic coating to a part. For mechanical plating, the part is rotated in a drum containing a water-based solution, glass beads, and metal powder. In vapor plating, a metallic coating is applied by atomizing the metal and applying an electric charge to the part, which causes the atomized (vapor phase) metal to adhere to the part. Wastewater generated in this operation includes spent solutions from the process bath and rinse water. Typically, the wastewater contains high concentrations of the applied metal.

Metallic Fiber Cloth Manufacturing involves weaving thin metallic fibers to create a mesh cloth.

Metal Spraying (Including Water Curtain) involves applying a metallic coating to a part by projecting molten or semimolten metal particles onto a substrate. Coatings can be sprayed from rod or wire stock or from powdered material. The process involves feeding the material (e.g., wire) into a flame where it is melted. The molten stock then is stripped from the end of the wire and atomized by a high-velocity stream of compressed air or other gas that propels the material onto a prepared substrate or part. Metal spraying coatings are used in a wide range of special applications, including: insulating layers in applications such as induction heating coils; electromagnetic interference shielding; thermal barriers for rocket engines; nuclear moderators; films for hot isostatic pressing; and dimensional restoration of worn parts. Metal spraying is sometimes performed in front of a "water curtain" (a circulated water stream used to trap overspray) or a dry filter exhaust hood that captures the overspray and fumes. With water curtain systems, water is recirculated from a sump or tank. Wastewater is generated when the sump or tank is discharged periodically. Metal spraying typically is not followed by rinsing.

Painting-Immersion (Including *Electrophoretic*, "E-coat") involves applying an organic coating to a part using processes such as autophoretic and electrophoretic painting.

(1) Autophoretic Painting involves applying an organic paint film by electrophoresis when a part is immersed in a suitable aqueous bath.

(2) Electrophoretic Painting is coating a part by making it either anodic or cathodic in a bath that is generally an aqueous emulsion of the organic coating material.

(3) Other Immersion Painting includes all other types of immersion painting such as dip painting.

Water is used in immersion paint operations as a carrier for paint particles and to rinse the part. Aqueous painting solutions and rinses typically are treated through an ultrafiltration system. The concentrate is returned to the painting solution, and the permeate is reused as rinse water. Sites typically discharge a bleed stream to treatment. The painting solution and rinses are batch discharged periodically to treatment.

Photo Imaging is the process of exposing a photoresist-laden printed wiring board to light to impact the circuitry design to the board. Water is not used in this operation.

Photo Image Developing is an operation in which a water-based solution is used to develop the exposed circuitry in a photoresist-laden printed wiring board. Wastewater generated in this operation includes spent process solution and rinse water.

Photoresist Application is an operation that uses heat and pressure to apply a photoresist coating to a printed wiring board. Water is not used in this operation.

Photoresist Strip involves removing organic photoresist material from a printed wiring board using an acid solution.

Phosphor Deposition is the application of a phosphorescent coating to a part. Wastewater generated in this unit operation includes water used to keep the parts clean and wet while the coating is applied, and rinse water used to remove excess phosphorescent coating from the part.

Physical Vapor Deposition involves physically removing a material from a source through evaporation or sputtering, using the energy of the vapor particles in a vacuum or partial vacuum to transport the removed material, and condensing the removed material as a film onto the surface of a part or other substrate.

Plasma Arc Machining involves removing material or shaping a part by a high-velocity jet of high-temperature, ionized gas. A gas (nitrogen, argon, or hydrogen) is passed through an electric arc, causing the gas to become ionized, and heated to temperatures exceeding 16,650 °C (30,000 °F). The relatively narrow plasma jet melts and displaces the material in its path. Because plasma arc machining does not depend on a chemical reaction between the gas and the part, and because plasma temperatures are extremely high, the process can be used on almost any metal, including those that are resistant to oxygen-fuel gas cutting. The method is used mainly for profile cutting of stainless steel and aluminum alloys. Although plasma arc machining typically is a dry process, water is used for water injection plasma arc torches. In these cases, a constricted swirling flow of water surrounds the cutting arc. This operations also may be performed immersed in a water bath. In both cases, water is used to stabilize the arc, to cool the part, and to contain smoke and fumes.

Plastic Wire Extrusion involves applying a plastic material to a metal wire through an extrusion process.

Salt Bath Descaling involves removing surface oxides or scale from a part by immersing the part in a molten salt bath or hot salt solution. Salt bath descaling solutions can contain molten salts, caustic soda, sodium hydride, and chemical additives. Molten salt baths are used in a salt bath-water quench-acid dip sequence to remove oxides from stainless steel and other corrosion-resistant alloys. In this process, the part typically is immersed in the molten salt, quenched with water, and then dipped in acid. Oxidizing, reducing, or electrolytic salt baths can be used depending on the oxide to be removed. Wastewater generated during salt bath descaling includes spent process solutions, quenches, and rinses.

Shot Tower—Lead Shot Manufacturing involves dropping molten lead from a platform on the top of a tower through a sieve-like device and into a vat of cold water.

Soldering involves joining metals by inserting a thin (capillary thickness) layer of non-ferrous filler metal into the space between them. Bonding results from the intimate contact produced by the metallic bond formed between the substrate metal and the solder alloy. The term soldering is used where the melting temperature of the filler is below 425 °C (800 °F). Some soldering operations use a solder flux, which is an aqueous or nonaqueous material used to dissolve, remove, or prevent the formation of surface oxides on the part. Except for the use of aqueous fluxes, soldering typically is a dry operation; however, a quench or rinse sometimes follows soldering to cool the part or remove excess flux or other foreign material from its surface. Recent developments in soldering technology have focused on fluxless solders and fluxes that can be cleaned off with water.

Solder Flux Cleaning involves removing residual solder flux from a printed circuit board using either an alkaline or alcohol cleaning solution.

Solder Fusing involves coating a tin-lead plated circuit board with a solder flux and then passing the board through a hot oil. The hot oil fuses the tin-lead to the board and creates a solder-like finish on the board.

Solder Masking involves applying a resistive coating to certain areas of a circuit board to protect the areas during subsequent processing.

Sputtering is a vacuum evaporation process in which portions of a coating material are physically removed from a substrate and deposited a thin film onto a different substrate.

Stripping (Paint) involves removing a paint (or other organic) coating from a metal basis material. Stripping commonly is performed as part of the manufacturing process to re-

cover parts that have been improperly coated or as part of maintenance and rebuilding to restore parts to a usable condition. Organic coatings (including paint) are stripped using thermal, mechanical, and chemical means. Thermal methods include burn-off ovens, fluidized beds of sand, and molten salt baths. Mechanical methods include scraping and abrasive blasting (as defined in "Abrasive Blasting" in appendix B of this part). Chemical paint strippers include alkali solutions, acid solutions, and solvents (e.g., methylene chloride). Wastewater generated during organic coating stripping includes process solutions (limited mostly to chemical paint strippers and rinses).

Stripping (Metallic Coating) involves removing a metallic coating from a metal basis material. Stripping is commonly part of the manufacturing process to recover parts that have been improperly coated or as part of maintenance and rebuilding to restore parts to a usable condition. Metallic coating stripping most often uses chemical baths, although mechanical means (e.g., grinding, abrasive blasting) also are used. Chemical stripping frequently is performed as an aqueous electrolytic process. Wastewater generated during metallic coating stripping includes process solutions and rinses. Stripping solutions become contaminated from dissolution of the base metal. Typically, the entire solution is discharged to treatment. Rinsing is used to remove the corrosive film remaining on the parts.

Thermal Infusion uses heat to infuse metal powder or dust onto the surface of a part. Typically, thermal infusion is a dry operation. In some cases, however, water may be used to remove excess metal powder, metal dust, or molten metal.

Ultrasonic Machining involves forcing an abrasive liquid between a vibrating tool and a part. Particles in the abrasive liquid strike the part, removing any microscopic flakes on the part.

Vacuum Impregnation is used to reduce the porosity of the part. A filler material (usually organic) is applied to the surface of the part and polymerized under pressure and heat. Wastewater is generated in this unit operation when rinse water is used to remove residual organic coating from the part.

Vacuum Plating involves applying a thin layer of metal oxide onto a part using molten metal in a vacuum chamber.

Water Shedder involves applying a dilute water-based chemical compound to a part to accelerate drying. This operation typically is used to prevent a part from streaking when excess water remains on the part.

Wet Air Pollution Control involves using water to remove chemicals, fumes, or dusts that are entrained in air streams exhausted from process tanks or production areas. Most frequently, wet air pollution control devices are used with electroplating, cleaning, and

coating processes. A common type of wet air pollution control is the wet packed scrubber consisting of a spray chamber that is filled with packing material. Water is continuously sprayed onto the packing and the air stream is pulled through the packing by a fan. Pollutants in the air stream are absorbed by the water droplets and the air is released to the atmosphere. A single scrubber often serves numerous process tanks; however, the air streams typically are segregated by source into chromium, cyanide, and acid/alkaline sources. Wet air pollution control can be divided into several suboperations, including:

- (1) Wet Air Pollution Control for Acid Alkaline Baths;
- (2) Wet Air Pollution Control for Cyanide Baths;
- (3) Wet Air Pollution Control for Chromium-Bearing Baths; and
- (4) Wet Air Pollution Control for Fumes and Dusts.

Wire Galvanizing Flux involves using flux to remove rust and oxide from the surface of steel wire prior to galvanizing. This provides long-term corrosion protection for the steel wire.

PART 439—PHARMACEUTICAL MANUFACTURING POINT SOURCE CATEGORY

GENERAL

Sec.

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