§ 438.13 Effluent limitations attainable by application of the best control technology for conventional pollutants (BCT).

Except as provided at 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve the following effluent limitation representing the application of BCT: Limitations for TSS, O&G (as HEM) and pH are the same as the corresponding limitation specified at § 438.12.

§ 438.15 New source performance standards (NSPS).

New point sources subject to this subpart must achieve the new source performance standards (NSPS) for TSS, O&G (as HEM), and pH, which are the same as the corresponding limitation specified at § 438.12. The performance standards apply with respect to each new point source that commences discharge after June 12, 2003.

APPENDIX A TO PART 438—TYPICAL PRODUCTS IN METAL PRODUCTS AND MACHINERY SECTORS

AEROSPACE	AIRCRAFT	BUS & TRUCK
Guided Missiles & Space Vehicle	Aircraft Engines & Engine Parts	Bus Terminal & Service Facilities
Guided Missile & Space Vehicle Prop	Aircraft Frames Manufacturing	Courier Services, Except by Air Freight Truck Terminals, W/ or W/O Maintenance.
Other Space Vehicle & Missile Parts	Aircraft Parts & Equipment	Intercity & Rural Highways (Buslines)
	Airports, Flying Fields, & Services	Local & Suburban Transit (Bus & subway)
		Local Passenger. Trans. (Lim., Amb., Sight See)
		Local Trucking With Storage
		Local Trucking Without Storage
		Motor Vehicle Parts & Accessories
		School Buses
		Trucking
		Truck & Bus Bodies
		Truck Trailers

ELECTRONIC EQUIPMENT	HARDWARE	HOUSEHOLD EQUIPMENT
Communications Equipment	Architectural & Ornamental Metal Work	Commercial, Ind. & Inst. Elec. Lighting Fixtures
Connectors for Electronic Applications	Bolts, Nuts, Screws, Rivets & Washers	Current-Carrying Wiring Devices
Electric Lamps	Crowns & Closures	Electirc Housewares & Fans
Electron Tubes	Cutlery	Electric Lamps
Electronic Capacitors	Fabricated Metal Products	Farm Freezers
Electronic Coils & Transformers	Fabricated Pipe & Fabricated Pipe Fittings	Household Appliances
Electronic Components	Fabricated Plate Work (Boiler Shops)	Household Cooking Equipment
Radio & TV Communications Equipment	Fabricated Structural Metal	Household Refrig. & Home & Farm Freezers
Telephone & Telegraph Apparatus	Fasteners, Buttons, Needles & Pins	Household Laundry Equipment
	Fluid Power Values & Hose Fittings	Household Vacuum Cleaners
	Hand & Edge Tools	Lighting Equipment
	Hand Saws & Saw Blades	Noncurrent-Carrying Wiring Devices
	Hardware	Radio & Television Repair Shops
	Heating Equipment, Except Electric	Radio & Television Sets Except Commn. Types
	Industrial Furnaces & Ovens	Refrig. & Air Cond. Serv. & Repair Shops
	Iron & Steel Forgings	Residential Electrical Lighting Fixtures
	Machine Tool Accessories & Measuring Devices	
	Machine Tools, Metal Cutting Types	
	Machine Tools, Metal Forming Types	
	Metal Shipping Barrels, Drums, Kegs, Pails	
	Metal Stampings	
	Power Driven Hand Tools	
	Prefabricated Metal Buildings & Components	
	Screw Machine Products	
	Sheet Metal Work	
	Special Dies & Tools, Die Sets, Jigs, Etc.	
	Steel Springs	
	Valves & Pipe Fittings	
	Wire Springs	

INSTRUMENTS	MOBILE INDUSTRIAL EQUIPMENT	MOTOR VEHICLE
Analytical Instruments	Construction Machinery & Equipment	Auto Exhaust System Repair Shops
Automatic Environmental Controls	Farm Machinery & Equipment	Automobile Dealers (new & used)
Coating, Engraving, & Allied Services	Garden Tractors & Lawn & Garden Equipment	Auto. Dealers (Dunebuggy, Go-cart, Snowmobile)
Dental Equipment & Supplies	Hoist, Industrial Cranes & Monorails	Automobile Service (includes Diag. & Insp. Cntrs.)
Ophthalmic Goods	Industrial Trucks, Tractors, Trailers, Tanks & Tank Components	Automotive Equipment
Fluid Meters & Counting Devices	Mining machinery & equipment, except oil field	Automotive Glass Replacement Shops
Instruments to Measure Electricity		Automotive Repairs Shops
Laboratory Apparatus & Furniture Manufacturing Industries		Automotive Stampings
Measuring & Controlling Devices		Automotive Transmission Repair Shops
Optical Instruments & Lenses		Carburetors, Pistons Rings, Values
Orthopedic, Prosthetic, & Surgical Supplies		Electrical Equipment for Motor
Pens, Mechanical Pencils, & Parts		General Automotive Repair Shops
Process Control Instruments		Mobile Homes
Search & Navigation Equipment		Motor Vehicle & Automotive Bodies
Surgical & Medical Instruments & Apparatus		Motor Vehicle Parts & Accessories
Watches, Clocks, Associated Devices & Parts		Motorcycle Dealers
		Motorcycles
		Passenger Car Leasing
		Recreational & Utility Trailer Dealers
		Taxicabs
		Top & Body Repair & Paint Shops
		Travel Trailers & Campers
		Vehicles
		Vehicular Lighting Equipment
		Welding Shops (includes Automotive)

INSTRUMENTS OFFICE MACHINE	ORDNANCE	PRECIOUS METALS & JEWELRY
Calculating & Accounting Equipment	Ammunition	Costume Jewelry
Computer Maintenance & Repair	Ordnance & Accessories	Jewelers' Materials & Lapidary Work
Computer Peripheral Equipment	Small Arms	Jewelry, Precious Metal
Computer Related Services	Small Arms Ammunition	Musical Instruments
Computer Rental & Leasing		Silverware, Plated Ware, & Stainless
Computer Storage Devices		
Computer Terminals		
Electrical & Electronic Repair		
Electronic Computers		
Office Machines		
Photographic Equipment & Supplies		

RAILROAD	SHIPS & BOATS	STATIONARY INDUSTRIAL EQUIPMENT
Line-Haul Railroads	Boat Building & Repairing	Air & Gas Compressors
Railcars, Railway Systems	Deep Sea Domestic Transportation of Freight	Automatic Vending Machines
Switching & Terminal Stations	Deep Sea Passenger Transportation, Except by Ferry	Ball & Roller Bearings
	Freight Transportation on the Great Lakes Marinas	Blowers & Exhaust & Ventilation Fans
	Ship Building & Repairing	Commercial Laundry Equipment
	Towing & Tugboat Service	Conveyors & Conveying Equipment
	Water Passenger Transportation Ferries	Electric Industrial Apparatus
	Water Transportation of Freight	Elevators & Moving Stairways
	Water Transportation Services	Equipment Rental & Leasing
		Food Product Machinery
		Fluid Power Cylinders & Actuators
		Fluid Power Pumps & Motors
		General Industrial Machinery
		Heavy Construction Equipment Rental
		Industrial Machinery
		Industrial Patterns
		Industrial Process Furnaces & Ovens
		Internal Combustion Engines
		Measuring & Dispensing Pumps
		Mechanical Power Transmission Equipment
		Metal Working Machinery
		Motors & Generators
		Oil Field Machinery & Equipment
		Packaging Machinery
		Paper Industries Machinery
		Printing Trades Machinery & Equipment
		Pumps & Pumping Equipment
		Refrigeration & Air & Heating Equipment
		Relays & Industrial Controls
		Rolling Mill Machinery & Equipment
		Scales & Balances, Except Laboratory
		Service Industry Machines
		Special Industry Machinery
		Speed Changers, High Speed Drivers & Gears
		Steam, Gas, Hydraulic Turbines, Generator Units
		Switchgear & Switchboard Apparatus
		Textile Machinery
		Transformers
		Welding Apparatus
		Woodworking Machinery

MISCELLANEOUS METAL PRODUCTS		
Miscellaneous Fabricated Wire Products		
Miscellaneous Metal Work		
Miscellaneous Repair Shops & Related Services		
Miscellaneous Transportation Equipment		

APPENDIX B TO PART 438—OILY 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 Blasting involves removing surface film from a part by using abrasive directed at high velocity against the part. Abrasive blasting includes bead, grit, shot, and sand blasting, and may be performed either dry or with water. The primary applications of wet abrasive blasting include: Removing burrs on precision parts; producing satin or matte finishes; removing fine tool marks; and removing light mill scale, surface oxide, or welding scale. Wet blasting can be used to finish fragile items such as electronic components. Also, some aluminum parts are wet blasted to achieve a fine-grained matte finish for decorative purposes. In abrasive blasting, the water and abrasive typically are reused until the particle size diminishes due to impacting and fracture.

Adhesive Bonding involves joining parts using an adhesive material. Typically, an organic bonding compound is used as the adhesive. This operation usually is dry; however, aqueous solutions may be used as bonding agents or to contain residual organic bonding materials.

Alkaline Cleaning for Oil Removal is a general term for the application of an alkaline cleaning agent to a metal part to remove oil and grease during the manufacture, maintenance, or rebuilding of a metal product. This unit operation does not include washing of the finished products after routine use (as defined in "Washing (Finished Products)" in this appendix), or applying an alkaline cleaning agent to remove nonoily contaminants such as dirt and scale (as defined in "Alkaline Treatment Without Cyanide" in this appendix and "Alkaline Treatment With Cyanide" in appendix C of this part). Wastewater generated includes spent cleaning solutions and rinse waters.

(1) Alkaline cleaning is performed to remove foreign contaminants from parts. This operation usually is done prior to finishing (e.g., electroplating).

(2) Emulsion cleaning is an alkaline cleaning operation that uses either complex chemical enzymes or common organic solvents (e.g., kerosene, mineral oil, glycols, and benzene) dispersed in water with the aid of an emulsifying agent. The pH of the solvent usually is between 7 and 9, and, depending on the solvent used, cleaning is performed at temperatures from room temperature to 82 °C (180 °F). This operation often is used as a replacement for vapor degreasing.

Alkaline Treatment Without Cyanide is a general term used to describe the application of an alkaline solution not containing cyanide to a metal surface to clean the metal surface or prepare the metal surface for further surface finishing.

Aqueous Degreasing involves cleaning metal parts using aqueous-based cleaning chemicals primarily to remove residual oils and greases from the part. Residual oils can be from previous operations (e.g., machine coolants), oil from product use in a dirty environment, or oil coatings used to inhibit corrosion. Wastewater generated by this operation includes spent cleaning solutions and rinse waters.

Assembly/Disassembly involves fitting together previously manufactured or rebuilt parts or components into a complete metal product or machine or taking a complete metal product or machine apart. Assembly/disassembly operations are typically dry; however, special circumstances can require water for cooling or buoyancy. Also, rinsing may be necessary under some conditions.

Burnishing involves finish sizing or smooth finishing a part (previously machined or ground) by displacing, rather than removing, minute surface irregularities with smooth point or line-contact, fixed or rotating tools. Lubricants or soap solutions can be used to cool the tools used in burnishing operations. Wastewater generated during burnishing include process solutions and rinse water.

Calibration is performed to provide reference points for the use of a product. This unit operation typically is dry, although water may be used in some cases (e.g., pumping water for calibration of a pump). Water

used in this unit operation usually does not contain additives.

Corrosion Preventive Coating involves applying removable oily or organic solutions to protect metal surfaces against corrosive environments. Corrosion preventive coatings include, but are not limited to: Petrolatum compounds, oils, hard dry-film compounds, solvent-cutback petroleum-based compounds, emulsions, water-displacing polar compounds, and fingerprint removers and neutralizers. Corrosion preventive coating does not include electroplating, or chemical conversion coating operations. Many corrosion preventive materials also are formulated to function as lubricants or as a base for paint. Typical applications include: Assembled machinery or equipment in standby storage; finished parts in stock or spare parts for replacement; tools such as drills, taps, dies, and gauges; and mill products such as sheet, strip, rod and bar. Wastewater generated during corrosion preventive coating includes spent process solutions and rinses. Process solutions are discharged when they become contaminated with impurities or are depleted of constituents. Corrosion preventive coatings typically do not require an associated rinse, but parts are sometimes rinsed to remove the coating before further processing.

Electrical Discharge Machining involves removing metals by a rapid spark discharge between different polarity electrodes, one the part and the other the tool, separated by a small gap. The gap may be filled with air or a dielectric fluid. This operation is used primarily to cut tool alloys, hard nonferrous alloys, and other hard-to-machine materials. Most electrical discharge machining processes are operated dry; however, in some cases, the process uses water and generates wastewater containing dielectric fluid.

Floor Cleaning (in Process Area) removes dirt, debris, and process solution spills from process area floors. Floors can be cleaned using wet or dry methods, such as vacuuming, mopping, dry sweeping, and hose rinsing. Non-process area floor cleaning in offices and other similar non-process areas is not included in this unit operation.

Grinding involves removing stock from a part by using abrasive grains held by a rigid or semirigid binder. Grinding shapes or deburrs the part. The grinding tool usually is a disk (the basic shape of grinding wheels), but can also be a cylinder, ring, cup, stick, strip, or belt. The most commonly used abrasives are aluminum oxide, silicon carbide, and diamond. The process may use a grinding fluid to cool the part and remove debris or metal fines. Wastewater generated during grinding includes spent coolants and rinses. Metal-working fluids become spent for a number of reasons, including increased biological activity (*i.e.,* the fluids become rancid) or decomposition of the coolant additives. Rinse waters typically are assimilated into the working fluid or treated on site.

Heat Treating involves modifying the physical properties of a part by applying controlled heating and cooling cycles. This operation includes tempering, carburizing, cyaniding, nitriding, annealing, aging, normalizing, austenitizing, austempering, siliconizing, martempering, and malleablizing. Parts are heated in furnaces or molten salt baths, and then may be cooled by quenching in aqueous solutions (e.g., brine solutions), neat oils (pure oils with little or no impurities), or oil/water emulsions. Heat treating typically is a dry operation, but is considered a wet operation if aqueous quenching solutions are used. Wastewater includes spent quench water and rinse water.

Impact Deformation involves applying impact force to a part to permanently deform or shape it. Impact deformation may include mechanical processes such as hammer forging, shot peening, peening, coining, high-energy-rate forming, heading, or stamping. Natural and synthetic oils, light greases, and pigmented lubricants are used in impact deformation operations. Pigmented lubricants include whiting, lithapone, mica, zinc oxide, molybdenum disulfide, bentonite, flour, graphite, white lead, and soap-like materials. These operations typically are dry, but wastewater can be generated from lubricant discharge and from rinsing operations associated with the operation.

Iron Phosphate Conversion Coating is the process of applying a protective coating on the surface of a metal using a bath consisting of a phosphoric acid solution containing no metals (e.g., manganese, nickel, or zinc) or a phosphate salt solution (*i.e.,* sodium or potassium salts of phosphoric acid solutions) containing no metals (e.g., manganese, nickel, or zinc) other than sodium or potassium. Any metal concentrations in the bath are from the substrate.

Machining involves removing stock from a part (as chips) by forcing a cutting tool against the part. This includes machining processes such as turning, milling, drilling, boring, tapping, planing, broaching, sawing, shaving, shearing, threading, reaming, shaping, slotting, hobbing, and chamfering. Machining processes use various types of metal-working fluids, the choice of which depends on the type of machining being performed and the preference of the machine shop. The fluids can be categorized into four groups: Straight oil (neat oils), synthetic, semi-synthetic, and water-soluble oil. Machining operations generate wastewater from working fluid or rinse water discharge. Metal-working fluids periodically are discarded because of reduced performance or development of a rancid odor. After machining, parts are sometimes rinsed to remove coolant and metal chips. The coolant reservoir is

sometimes rinsed, and the rinse water is added to the working fluid.

Painting-Spray or Brush (Including Water Curtains) involves applying an organic coating to a part. Coatings such as paint, varnish, lacquer, shellac, and plastics are applied by spraying, brushing, roll coating, lithographing, powder coating, and wiping. Water is used in painting operations as a solvent (water-borne formulations) for rinsing, for cleanup, and for water-wash (or curtain) type spray booths. Paint spray booths typically use most of the water in this unit operation. Spray booths capture overspray (*i.e.*, paint that misses the product during application), and control the introduction of pollutants into the workplace and environment.

Polishing involves removing stock from a part using loose or loosely held abrasive grains carried to the part by a flexible support. Usually, the objective is to achieve a desired surface finish or appearance rather then to remove a specified amount of stock. Buffing is included in this unit operation, and usually is performed using a revolving cloth or sisal buffing wheel, which is coated with a suitable compound. Liquid buffing compounds are used extensively for large-volume production on semiautomated or automated buffing equipment. Polishing operations typically are dry, although liquid compounds and associated rinses are used in some polishing processes.

Pressure Deformation involves applying force (other than impact force) to permanently deform or shape a part. Pressure deformation may include rolling, drawing, bending, embossing, sizing, extruding, squeezing, spinning, necking, forming, crimping or flaring. These operations use natural and synthetic oils, light greases, and pigmented lubricants. Pigmented lubricants include whiting, lithapone, mica, zinc oxide, molybdenum disulfide, bentonite, flour, graphite, white lead, and soap-like materials. Pressure deformation typically is dry, but wastewater is sometimes generated from the discharge of lubricants or from rinsing associated with the process.

Solvent Degreasing removes oils and grease from the surface of a part using organic solvents, including aliphatic petroleum (e.g., kerosene, naphtha), aromatics (e.g., benzene, toluene), oxygenated hydrocarbons (e.g., ketones, alcohol, ether), and halogenated hydrocarbons (e.g., 1,1,1-trichloroethane, trichloroethylene, methylene chloride). Solvent cleaning takes place in either the liquid or vapor phase. Solvent vapor degreasing normally is quicker than solvent liquid degreasing. However, ultrasonic vibration is sometimes used with liquid solvents to decrease the required immersion time of complex shapes. Solvent cleaning often is used as a precleaning operation prior to alkaline cleaning, as a final cleaning of precision parts, or as surface preparation for some painting operations. Solvent degreasing operations typically are not followed by rinsing, although rinsing is performed in some cases.

Steam Cleaning removes residual dirt, oil, and grease from parts after processing though other unit operations. Typically, additives are not used in this operation; the hot steam removes the pollutants. Wastewater is generated when the cleaned parts are rinsed.

Testing (e.g., hydrostatic, dye penetrant, ultrasonic, magnetic flux) involves applying thermal, electrical, mechanical, hydraulic, or other energy to determine the suitability or functionality of a part, assembly, or complete unit. Testing also may include applying surface penetrant dyes to detect surface imperfections. Other examples of tests frequently performed include electrical testing, performance testing, and ultrasonic testing; these tests typically are dry but may generate wastewater under certain circumstances. Testing usually is performed to replicate some aspect of the working environment. Wastewater generated during testing includes spent process solutions and rinses.

Thermal Cutting involves cutting, slotting, or piercing a part using an oxy-acetylene oxygen lance, electric arc cutting tool, or laser. Thermal cutting typically is a dry process, except for the use of contact cooling waters and rinses.

Tumbling/Barrel Finishing/Mass Finishing/Vibratory Finishing involves polishing or deburring a part using a rotating or vibrating container and abrasive media or other polishing materials to achieve a desired surface appearance. Parts to be finished are placed in a rotating barrel or vibrating unit with an abrasive media (e.g., ceramic chips, pebbles), water, and chemical additives (e.g., alkaline detergents). As the barrel rotates, the upper layer of the part slides toward the lower side of the barrel, causing the abrading or polishing. Similar results can be achieved in a vibrating unit, where the entire contents of the container are in constant motion, or in a centrifugal unit, which compacts the load of media and parts as the unit spins and generates up to 50 times the force of gravity. Spindle finishing is a similar process, where parts to be finished are mounted on fixtures and exposed to a rapidly moving abrasive slurry. Wastewater generated during barrel finishing includes spent process solutions and rinses. Following the finishing process, the contents of the barrel are unloaded. Process wastewater is either discharged continuously during the process, discharged after finishing, or collected and reused. The parts are sometimes given a final rinse to remove particles of abrasive media.

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 at "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 systems.

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 catalysis. An electric current is not used in this operations. 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 diminishes. 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 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 nonferrous 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 recover 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.
439.0 Applicability.
439.1 General definitions.
439.2 General monitoring requirements.
439.3 General pretreatment standards.
439.4 General limitation or standard for pH.

Subpart A—Fermentation Products

439.10 Applicability.
439.11 Special definitions.
439.12 Effluent limitations attainable by the application of the best practicable control technology currently available (BPT).
439.13 Effluent limitations attainable by the application of the best conventional pollutant control technology (BCT).
439.14 Effluent limitations attainable by the application of best available technology economically achievable (BAT).
439.15 New source performance standards (NSPS).
439.16 Pretreatment standards for existing sources (PSES).
439.17 Pretreatment standards for new sources (PSNS).

Subpart B—Extraction Products

439.20 Applicability.
439.21 Special definitions.
439.22 Effluent limitations attainable by the application of the best practicable control technology currently available (BPT).
439.23 Effluent limitations attainable by the application of the best conventional pollutant control technology (BCT).
439.24 Effluent limitations attainable by the application of best available technology economically achievable (BAT).
439.25 New source performance standards (NSPS).
439.26 Pretreatment standards for existing sources (PSES).
439.27 Pretreatment standards for new sources (PSNS).

Subpart C—Chemical Synthesis Products

439.30 Applicability.
439.31 Special definitions.
439.32 Effluent limitations attainable by the application of the best practicable control technology currently available (BPT).
439.33 Effluent limitations attainable by the application of the best conventional pollutant control technology (BCT).
439.34 Effluent limitations attainable by the application of best available technology economically achievable (BAT).
439.35 New source performance standards (NSPS).
439.36 Pretreatment standards for existing sources (PSES).
439.37 Pretreatment standards for new sources (PSNS).

Subpart D—Mixing/Compounding and Formulation

439.40 Applicability.
439.41 Special definitions.
439.42 Effluent limitations attainable by the application of the best practicable control technology currently available (BPT).
439.43 Effluent limitations attainable by the application of the best conventional pollutant control technology (BCT).
439.44 Effluent limitations attainable by the application of best available technology economically achievable (BAT).
439.45 New source performance standards (NSPS).
439.46 Pretreatment standards for existing sources (PSES).
439.47 Pretreatment standards for new sources (PSNS).

Subpart E—Research

439.50 Applicability.
439.51 Special definitions.
439.52 Effluent limitations attainable by the application of the best practicable control technology currently available (BPT).