Fact Sheet
January 2002

Jewelry Manufacturing Pollution Prevention Recommendations

JEWELRY MANUFACTURING INDUSTRY

DTSC is one of six Boards and Departments within the California Environmental Protection Agency. DTSC's mission is to restore, protect and enhance the environment, to ensure public health, environmental quality and economic vitality, by regulating hazardous waste, conducting and overseeing cleanups, and developing and promoting pollution prevention.

State of California

California Environmental Protection Agency

Introduction

Jewelry making is one of the world's oldest manufacturing operations and has always involved some hazardous processes. Today, hazardous chemicals used in jewelry manufacturing pose a major concern. These chemicals include cyanides, acids, solvents, compressed gases, investment dusts, polishing compounds, and solders. This fact sheet discusses safe handling practices and appropriate pollution prevention measures for these hazardous chemicals. Jewelry manufacturers are increasingly worried about their workers' health and safety conditions, as well as reducing pollution in the environment. Most jewelry companies want to prevent work-related illness and injury, and they want to prevent pollution from their manufacturing processes, while still producing quality products at reasonable prices. Many of the pollution prevention measures discussed in this fact sheet increase product quality and save the manufacturer money, paying for themselves in a short time.

Wax Mold Production

Proper model construction during wax mold production will minimize sprues and gates. This will reduce the need to cut, grind, and polish and decrease the loss of precious metals. Do not use mold release sprays with atmospheric ozone depleters in creating wax images. Chlorofluorocarbons (CFCs) have already been banned and should not be in any of the mold release sprays. Hydrochlorofluorocarbons (HCFCs) will be phased out in the next few years. Avoid products with HCFC-141b and HCFC-22. Products containing these ozone depleters will become more expensive and eventually will not be available. Alternative mold release agents are jeweler's talc, cornstarch, or baby powder. Take a piece of thin fabric (such as two layers of old ny-

For many wax designs, a simple replacement for mold release spray is cornstarch, baby powder, or jeweler's talc. The more finely ground powders work best. Photo courtesy of P. Dulgerian.

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our web site at www.dtsc.ca.gov.

lons) about 4 inches square and put several tablespoons of jeweler's talc, cornstarch, or baby powder in the center. Gather the corners so you can hold the powder inside by wrapping a rubber band around the fabric above the powder. Then tap the release powder onto the inside of the mold before wax injection.

Dewaxing

Steam dewaxing machines should be used to remove most of the casting wax instead of burnoff ovens. Burning off casting wax releases sulfur and chlorine gases. Steam dewaxing machines melt most of the wax from the flasks and deposit it in shallow water-filled trays. Make sure that the steam dewaxing machine actually allows the water to boil when generating steam. Machines that cannot reach boiling temperature are less efficient and make the dewaxing process time consuming. You can then use a burnout kiln to remove the residual wax as well as to heat and cure the investment. Select the standard time and temperature settings for your particular investment to ensure the best product quality.

Steam dewaxers are available in different sizes. This one can hold several flasks. Photo courtesy of S. Sassounian.

Casting

Modern vacuum casting machines use inert gases such as helium, argon, and nitrogen to prevent oxidation. Achieving an oxidation-free casting eliminates or reduces subsequent cleaning steps. Always select alloys with deoxidizing additives to reduce the formation of oxides and fire scale. For smaller operations use an induction melter with an inert gas blow pipe to prevent oxidation. Keep metal molten for the shortest time possible to prevent contamination of the alloy, resulting in oxidation. Wear safety glasses, fireproof gloves, and aprons as personal protection while casting. Bolt centrifugal casting machines to the floor to prevent them from moving and tipping. Ensure machines spin only when the lids are closed to avoid spilling.

Although an initial investment is required, vacuum casting machines are automated, they improve product quality, and they reduce oxidation. Trees from vacuum casting machines require less cleaning and polishing. Photo courtesy of S. Sassounian.

An induction melter with an inert gas blow pipe can reduce oxidation during casting. Because they have no open flame and are smoke-free, induction melters are much safer and cleaner than casting or melting torches. Photo courtesy of P. Dulgerian.

Fast cleaning of the investment with high pressure water in an enclosed unit reduces exposure to harmful investment dust. Some units have foot pedal operation to allow your hands to be free for maneuvering the work. Some units also have filters which allow the water to be reused. Photo courtesy of P. Dulgerian.

Knockout or Devestment

Casting investment, sometimes called "gypsum" in the jewelry industry, contains silica dust. Long-term exposure to silica dust can cause silicosis, a disabling lung disease, and possibly cancer. Wear appropriate respiratory protection when weighing, mixing, and handling investment. Keep flasks under water when cured investment is broken up to free the cast trees. The water will prevent the silica dust from floating in the air. Once the investment is broken up, let the water and investment sit until they separate. Then, any precious metal droplets can be retrieved and the wet investment can be scooped up and disposed of properly. Another good method is a dry flask stripper with a dust collection system in an enclosed unit. An enclosed unit with an air filter prevents the release of silica dusts. Wash cabinets with high pressure water jets also remove investment efficiently, prevent worker exposure to silica dusts, and don't require the use of hazardous chemicals.

Cast Tree Cleaning

Hydrofluoric acid is more dangerous than other acids and should not be used in jewelry manufacturing. Like all strong acids, it causes painful burns that are slow to heal. But, hydrofluoric acid can also penetrate the skin and enter the bloodstream, where it can dissolve bone. Safer techniques that use no acids or chemicals are available to clean investment from the casting. These include ultrasonic baths, glass bead blasting, and water jet cleaning. If acid must be used, choose dilute hydrochloric acid (muriatic acid). When using acid, wear gloves (made of Neoprene, nitrile, or natural rubber), chemical goggles, and an acid-resistant coat. Install an emergency shower and eyewash fountain nearby. Never dispose of untreated acids down the drain.

Fire Scale and Oxide Removal

Fire scale and oxide removal was traditionally accomplished using cyanide bombing. Cyanide is a toxic compound that is potentially lethal if not handled with caution. Use special alloys containing deoxidizers that cast bright and require no stripping. When reusing these alloys, refresh or replace the deoxidizing agents since they are consumed when the metals are cast. Try the following to remove oxides rather than cyanide bombing:

Magnetic Tumblers - Fine steel pins propelled by magnets get into and clean even the smallest crevices. Magnetic tumblers can clean all size pieces of jewelry, including those with fine details. Magnetic tumblers are available in many sizes, so even the smallest shops can afford one.

Automated Mass Finishing - Many shops use a combination of machines and media to completely replace cyanide bombing. Plastic, natural, steel, and porcelain medias are available for cut down, and for dry and wet polishing. Do not select a silica-based compound. Labor costs are reduced, and the risks to worker health and safety are decreased when cyanide bombing is replaced by mass finishing.

Hand Finishing - Always use a fully enclosed polishing station when removing investment and fire scale by hand.

Pencil Bead Blasters or Micro Etchers - Use fine sand or aluminum oxide media.

Ultrasonic Cleaning Baths - Use ammonium phosphate or hydrogen peroxide for removing oxidation. Ultrasonic baths with filtration will extend the solution life and increase product quality.

Electric Acid Picklers - Use sodium bisulfate or dry granular acid compounds instead of sulfuric acid as a pickling agent. The pickle solutions work better when heated to a temperature of 125 °F.

SAFER JEWELRY MANUFACTURING EQUIPMENT ALTERNATIVES

One safe way to clean investment from the casting is with a heated ultrasonic bath using a water-based cleaner such as alkaline detergent solution. Photo courtesy of S. Sassounian.

Magnetic tumblers are available for even the largest jewelry manufacturing operations. Photo courtesy of S. Sassounian.

Mass finishers are another way to avoid cyanide bombing. They are automated and there is less metal loss from the jewelry pieces. A wide selection of polishing media is available for nearly all applications. Photo courtesy of V. Piliguian.

Substitute cyanide bombing with electrostripping processes that recover more of the dissolved gold. Cyanide peroxide bombing often results in a greater loss of valuable gold product because the gold dissolves into the bombing solution. Electrostripping processes are much safer than potassium or sodium cyanide systems. However, extensive pitting of the jewelry surface may occur if the operator is not well trained in controlling the temperature, voltage, and stripping times. Electrostripping is best suited for jewelry pieces with many recesses, heavy designs, and those that lend themselves to racking. Cyanide-bearing waste streams must undergo treatment to destroy the cyanide before treating to remove the metals. Enclosed bombing systems are available that destroy the cyanide and recover the metals without human contact.

For safety, using only premixed 4% cyanide solutions diluted with water is recommended. If acids are accidentally mixed with cyanide, cyanide gas will form that can cause instant death. Even weak acids such as coffee, sodas, citrus fruit, gum, and chewing tobacco, will form the deadly gas when mixed with cyanide. Be sure to follow these safety precautions: 1) Do all workers clearly understand the hazards of cyanide? 2) Are cyanide containers clearly labeled? 3) Do employees wear gloves whenever they handle cyanide? 4) Is the equipment that is used to measure and mix cyanide used only

An enclosed cyanide bombing system can clean the jewelry pieces, destroy the cyanide solution, and recover dissolved precious metals from the waste with minimal human contact. Photo courtesy of D. Cleinman.

for those purposes? 5) Are eating, drinking, and smoking prohibited in the stripping area? 6) Is access to cyanide limited to only those employees who need it?

Grinding and Deburring

Minimize casting cleanup and grinding by making clean cuts to the sprue. Pneumatic cutters are faster and more precise than cutting castings from the tree and sprues by hand or with mechanical cutters. Install ventilation systems to collect and trap precious metal dusts. Use floor mats that clean shoes and capture dusts. Do not use compressed air to blow grinding or polishing dusts from clothing.

Polishing

Some polishing compounds may cause damage to the lungs. Tripoli compounds with silica can cause the lung disease silicosis. Polishing compounds with iron oxide can cause the lung disease siderosis. Look for non-silica-based compounds that also do not contain iron oxides. Use an automatic spray polishing system with a water-based product. Try electropolishing, an electrochemical process requiring an electrolyte and DC current, which is the reverse of plating. Explore the use of bright or deoxidized alloys that cast bright and require no polishing. Use different rouges with different muslin buffs to provide a high luster finish. Use a fully enclosed polishing system which reduces dust releases. Make sure your dust collector on the polishing wheels is working properly. Two warning signs that the ventilation is not working well enough are: 1) Does grit accumulate rapidly around polishing wheels? 2) If you leave a sheet of clean paper sitting out in the polishing room, does it get covered with dust in a few days? Wear appropriate respiratory protection when polishing and when the blower filters or dust collection bags are being cleaned and changed. Jewelry manufacturers can often pay for new equipment with the precious metals recovered by a well designed and properly working dust collection system.

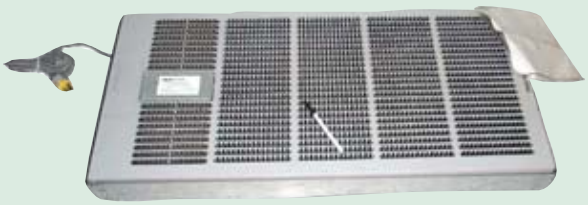
Cleaning

Avoid chlorinated solvents such as methylene chloride. The solvent 1,1,1-Trichloroethane (TCA)

SAFER JEWELRY MANUFACTURING EQUIPMENT ALTERNATIVES

Fully enclosed grinding stations will capture more precious metal dusts. These systems improve working conditions and can pay for themselves in a short time. Photo courtesy of S. Sassounian.

Polishing stations are available with filter and dust collection systems built-in. The precious metal dust collected can often pay for the equipment in a short time. The most efficient collection systems have fully enclosed work areas. Photo courtesy of V. Piliguian.



Floor mats capture precious metals clinging to your shoes that can be reclaimed. These simple systems pay for themselves with dust that would otherwise walk out the door! Photo courtesy of S. Sassounian.

has been banned and should no longer be used in cleaning jobs such as removing oil from screw threading machines. Most chlorinated solvents are hazardous when inhaled and can cause cancer with long-term exposure. Replace solvents with aqueous cleaners, soaps, and detergents. Replace mineral spirits with deionized water. Use ultrasonic baths with heated, water-based cleaners such as alkaline detergent solutions. Use steam cleaners. Ensure the steam tanks are UL or ITS listed. Avoid the use of acetone because it is highly flammable. Provide gloves and adequate ventilation when using acetone. Provide adequate ventilation when using ammonia.

Soldering

Use solders that do not contain cadmium or lead. Heating cadmium or lead creates hazardous fumes. Exposure to cadmium fumes can cause kidney disease and cancer. Exposure to lead can lead to nervous system damage, kidney damage, high blood pressure, and cancer. If you use solders with cadmium or lead, you must have ventilation systems and personal protective equipment. If you use paste solder, choose a flux that is free of fluoride compounds. Chronic exposure to fluoride can result in fluorosis, a weakening of the bones. Avoid solders with zinc chloride. Zinc chloride and zinc oxide fumes are both hazardous when inhaled. Use an antioxidant soldering flux before soldering to minimize oxidation and reduce the need to clean oxidation and fire scale deposits. Follow appropriate soldering practices such as solder selection, tip size selection and care, dross and oxidation accumulation, and temperature and time considerations to decrease the amount of polishing required. Ensure that work surfaces are made of fire resistant material. Maintain adequate ventilation with fume hoods. Replacement solders containing silver, copper, tin, and phosphorus are available. Many belt furnaces use anhydrous ammonia as a blanket to prevent oxidation. Exposure to anhydrous ammonia causes irritation of the respiratory tract, eyes, and skin. It can also cause blindness, pneumonia, and bronchitis. Check with the manufacturer to find out if your machine can be retrofitted to use nitrogen and hydrogen instead.

Laser welders and arc welders are two alternatives to traditional brazing methods. Laser welding is conducted under an inert gas atmosphere so that no fire scale is formed. The welding can be done even while stone settings are in place since the intense heat is localized. Arc welding produces no residual heat or surface oxidation. Many manufacturers find that they rarely need to use the old welding methods once they switch to laser or arc welding. Photo courtesy of S. Marukian.

A ventilation and filtering station such as this one can reduce your exposure to hazardous fumes. Photo

Acid Pickling

For larger pickling operations, use a series of three drag-out tanks to reduce the amount of metals discharged in contaminated rinse waters. As the acid pickle evaporates, use drag-out #1 to replenish the acid pickle solution, move drag-out #2 to drag-out #1 position, drag-out #3 to drag-out #2 position, and add a fresh water drag-out #3. This will greatly reduce the amount of metals being discharged in the final rinse. Closed loop systems are also available which can recover precious metals through ion exchange or membrane filtration. Install secondary containment around the pickle containers to capture spills, drips, and over-flows.

Plating

Plating operations generate hazardous wastes when the plating solution is rinsed off work pieces, which contaminates the rinse water. Wastes generated from plating operations can be reduced through good operating and maintenance procedures and by carefully controlling rinsing practices.

Good housekeeping measures will protect expensive plating solutions from contamination and prevent spills which would create wastes. This rhodium plating station has a containment tub with a lid so that the plating solution is safely stored while not in use. Photo courtesy of P. Dulgerian.

The operation of the plating bath can significantly affect the amount of wastes generated. By controlling the chemical concentration or the temperature of the process bath, the viscosity of the plating solution can be decreased, and dragout from the bath reduced. An object dipped in honey will have a much thicker film than one dipped in water. The same idea applies if you have a lower concentration or a higher temperature bath because less chemical, or dragout, will cling to the jewelry. Chemical suppliers may recommend a chemical concentration that is higher than necessary to perform the job. Determine the lowest process bath concentration that will provide adequate product quality. Operating process baths at elevated temperatures often allows you to use lower process bath concentrations. Fresh baths can be operated at a lower concentration than replenished baths. Use deionized water in place of common tap or softened water for plating bath make-ups and replenishment. Deionized water extends the life of the plating solution because it eliminates the introduction of contaminants like iron and chloride.

Determine the optimal removal rate and drainage time for work piece racks. Install bars or railings above process tanks to allow operators to hang work pieces to drain dragout into the process tanks. Install fog or spray rinse systems (that use deionized water) above the plating tanks. Install drip collection devices around each tank. Install drain boards to eliminate gaps between process bath tanks and their associated rinse tanks so that chemicals won't drip onto the floor and into the wastewater treatment system. Hold a drip tray below the work piece to collect any dragout when carrying a work piece to the rinse tank or between adjacent tanks.

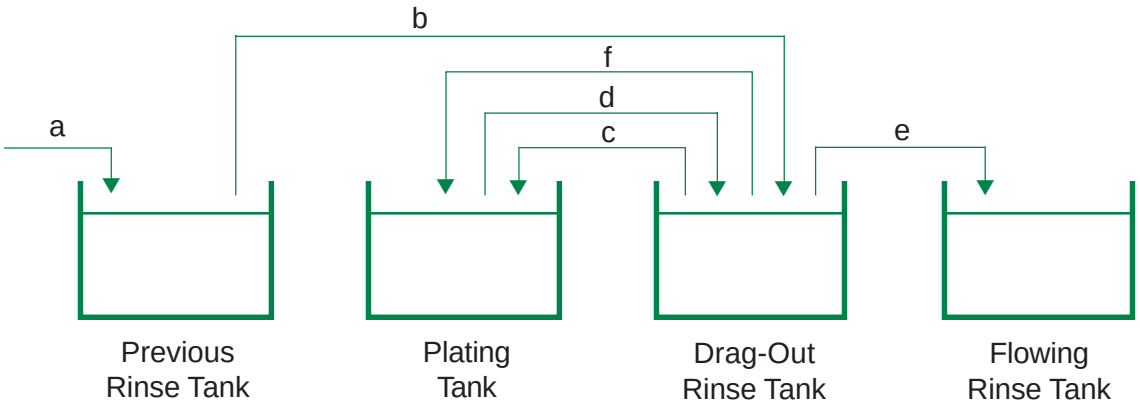
Extend the process bath life and improve the quality of plating by performing routine maintenance. Particle filters can remove debris and carbon filters can remove organic contaminants. Remove anodes from the plating bath when not in use to avoid the buildup of metals in the plating solution. Excess metals in the bath may require disposal of a portion of the bath.

Static rinse tanks are common in smaller shops. Even without running rinses, you can minimize waste by controlling which static rinse tanks get dirty first and have to be replaced. As shown in the

Operators can even employ drag-out reduction techniques on small scale plating systems. Try using a spray bottle filled with deionized water to rinse plating solution from the jewelry pieces. Just a little spray over a heated plating tank will wash expensive solutions back into the tank and replace water lost through evaporation. Photo courtesy of S. Sassounian.

Drag-In/Drag-Out Rinsing Technique

Drag-In/Drag-Out rinse techniques reclaim precious metal plating solutions that would otherwise be lost in the rinse water. These steps save money and reduce waste generation.



accompanying diagram, the following drag-in/drag-out rinsing techniques save plating solution and decrease waste generation:

a) The work pieces are placed in the previous rinse tank, which contains clean water.

b) The parts next are placed in the first dragout tank after the plating bath where they pick up dragout bath chemicals.

c) The parts are then placed in the plating bath, which drags in bath chemicals.

d) The parts go from the plating tank into the first dragout tank to rinse off most of the plating bath solution.

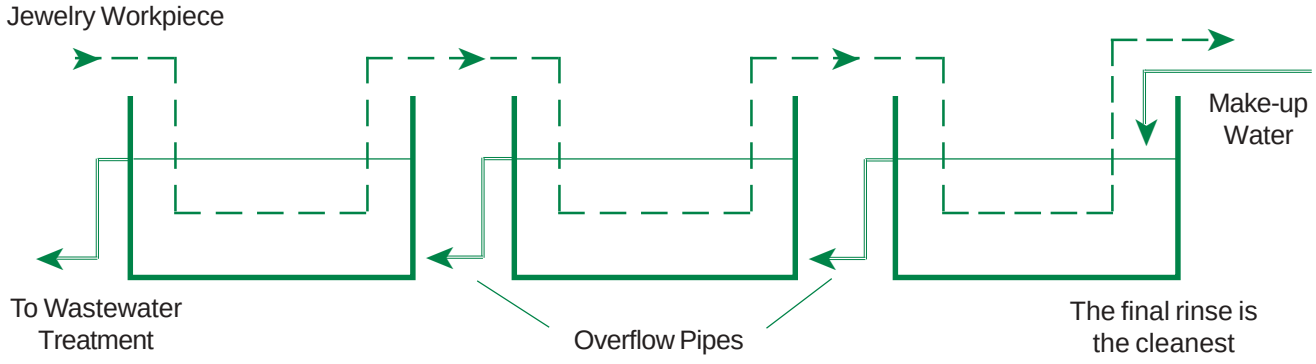
e) The parts go to the flowing rinse tank for final rinsing.

f) The solution in the first tank can often be returned to the plating tank to compensate for evaporative or dragout losses.

Running rinses are more common in large plating shops. A simple way to control the fresh water flow is to only have running water while the work pieces are in the rinse tank. Another way is to install timers that automatically turn off the water flow when the rinse tank is not in use. If properly used, flow restrictors on faucet heads or flow meters on water lines allow you to precisely control the amount of water provided. Determine the most efficient flow rate for each rinse stage to conserve water, reduce the volume of wastewater generated, and minimize sewer usage fees.

Countercurrent Rinse System

With a Countercurrent Rinse System the most concentrated rinsewater waste is placed back into the plating tank or released to the treatment system.



Countercurrent rinsing is a technique that reduces the amount of waste generated from large plating operations. Instead of the commonly used parallel tank system, countercurrent rinsing uses two or more tanks. Work pieces move in a direction countercurrent to the flow of rinse water. In a three rinse-tank system, fresh water enters only the third tank, which is farthest in the line from the

plating bath. Water from the third tank feeds into the second tank. Water from the second tank feeds into the first tank. Water from the first tank might be used to make up losses in the plating tank. Using this system, the dragout chemicals will concentrate in the first tank and diminish in concentration toward the third tank.

Controlling the flow of fresh water to the final rinse tank decreases the amount of wastewater being generated and requiring treatment. The best way to control the flow of fresh water is to directly control how dirty the final rinse tank is allowed to get. This can be done by installing a conductivity probe in the final rinse tank. Along with a conductivity controller and a solenoid valve on the water supply line, this system adds fresh water only when the contamination in the rinse tank reaches an unacceptable level. The controller is generally set to open the solenoid valve when the conductivity in the final rinse tank is about 15 percent greater than city tap water. This way the plater is assured that, even though the first rinse tanks may be dirty, the final rinse tank is always filled with clean water.

Hazardous Materials

Approved hazardous materials cabinets help keep your materials safely segregated and stored. Material segregation is an important tool for waste reduction because it eliminates contamination. Contaminated materials become wastes because they are no longer usable. Material contamination can cause spontaneous fires or release toxic gases.

Store hazardous materials in approved hazardous materials cabinets. Label cabinets with letters at least 3 inches in height. Only quantities of chemicals sufficient for one workday should be kept outside the cabinet. Remove and dispose of empty hazardous material containers properly. Do not store incompatible materials together. Again, mixing cyanide and acid (this includes coffee, sodas, gum, chewing tobacco, citrus fruit, etc.) will result in cyanide gas and can cause instant death. If bleach and acid mix, they will release chlorine gas. Accidentally mixing incompatible materials can happen while handling materials or in an earthquake or fire. Materials must be stored as follows:

Oxidizing materials in a yellow hazardous materials cabinet:

- Hydrogen Peroxide
- Sodium Hypochlorite (chlorine bleach)

Acids in a blue hazardous materials cabinet approved for corrosive materials. Never store acids and bases in the same cabinet.

- Hydrofluoric Acid (Store this material separately from your other acids)
- Sulfuric Acid
- Hydrochloric Acid
- Muriatic Acid
- Nitric Acid
- Sparex No.2
- Rhodium Plating Solutions
- Silver Plating Solutions
- Copper Plating Solutions
- Nickel Plating Solution
- Boric Acid

Flammable liquids in a red hazardous materials cabinet approved for flammable liquids:

- Methyl Alcohol (methanol, wood alcohol)
- Ethyl Alcohol (denatured alcohol, ethanol)
- Acetone
- Luxi Flux

Toxic materials in a green hazardous materials cabinet approved for poisons and toxic materials:

- Potassium Cyanide
- Sodium Cyanide
- Gold Plating Solutions
- Electro Stripping Solution
- Bombing Solution

Corrosive materials include acids and bases. Store acids and bases separately in blue hazardous material cabinets approved for corrosive materials:

- Aqueous Ammonia
- Soda Ash
- Sodium Carbonate Anhydrous
- Caustic Soda (sodium hydroxide)

Hazardous materials with no special storage requirements:

- Borax
- Chlorinated Solvents such as Methylene Chloride or Trichloroethylene
- Ferric Sulfate Solution
- Sodium Bisulfate
- Aqui Flux

Gases

Compressed gas cylinders must be secured upright to prevent falling over. Secure tanks to a fixed object like a wall stud with a chain, on a cart or other approved mobile device, or within a rack, cabinet, or similar approved assembly. Cylinders not in use must be protected by approved caps or collars. Compressed gases must be separated from combustibles by at least 10 feet. Do not expose cylinders to temperatures higher than 125 degrees Fahrenheit (52 degrees Centigrade) or to corrosive materials. Install all piping, tubing, valves, and fittings in accordance with the Plumbing Code.

Prohibited Gases:

- Acetylene (Instead, use hydrogen when working with platinum)
- Propane (Prohibited for jewelry manufacturing)

Other Gases:

- Anhydrous Ammonia (Soldering machines that require anhydrous ammonia may be retrofitted to use nitrogen and hydrogen. Check with your equipment manufacturer)
- Argon (Argon is used to melt platinum)
- Methane
- Nitrogen
- Odorized Hydrogen (Install an approved hydrogen gas detection system)
- Oxygen (Look into purchasing an oxygen generator. This will eliminate the need to handle oxygen tanks)

High pressure oxygen is available on a continuous basis with an oxygen generator. These systems are safer than pressurized tanks and reduce time and labor cost associated with handling cylinders. Photo courtesy of V. Piliguian.

Flammable Gas Torches

All workstations where torches are used or stored must have noncombustible holders 18 inches in height. Holding devices must be part of a listed product or be constructed to support the weight of the torch and hoses without visible distortion. Torches must be at least 18 inches away from combustible materials at all times for safety. All torch assemblies must have approved check valves attached in an approved manner. Torches and hoses must be American Gas Association, Canadian Gas Association, UL, or ITS listed and approved.

Additional Good Housekeeping Tips

Insist on suitable labels for all your materials. Labels must list the chemical contents, the hazards and health effects of exposure, any protective equipment required, shelf life date, and techniques for safe use. If you buy in volume and divide your chemicals into smaller containers, be sure to make your own new labels. Rotate your stock to use the earliest labeled stock first.

Do not eat or drink in the work area to avoid ingesting dust and particles. Do not smoke in your work areas to avoid a fire hazard.

Request a Material Safety Data Sheet (MSDS) for all of your products. Not all companies list the contents of their products on the container label. The MSDS identifies all hazardous materials in the product.

Further Information

Many of your hazardous waste requirements are administered by a Certified Uniform Program Agency (CUPA) such as your local fire department. Your local CUPA will help you with permits and other regulatory requirements. You can find your local CUPA by calling the California Environmental Protection Agency at (916) 445-5049. The CUPA list is also available on DTSC's Web site at www.dtsc.ca.gov/ContactDtsc/contacts2.html.

For additional copies of this publication, or for information about pollution prevention, contact the Office of Pollution Prevention and Technology Development at (800) 700-5854.

To get an EPA ID number, contact the Department of Toxic Substances Control Generator Information Services Unit at (800) 618-6942.

Disclaimers

This document provides only guidance for safe handling practices and pollution prevention for certain hazardous chemicals. Some of these measures are basic requirements of the Health and Safety Code and the California Code of Regulations. However, this fact sheet does not supercede or replace the statutes and regulations. This fact sheet was prepared in January 2002. Interested parties should always consult the most recent statutes and regulations.

The mention of commercial products, their sources, or their uses in this fact sheet is not an actual or implied endorsement of such products, suppliers, or uses.

For more information about regulatory requirements, contact the DTSC Office nearest you, or call the regional Public and Business Liaisons at (800) 72TOXIC (1-800-728-6942)

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This fact sheet is also available in Armenian, Spanish, and Vietnamese.
Esta información se encuentra disponible también en armenio, español y vietnamita.
Այս իրողութեան էջերը տրամադրուած են Անգլերենով, Հայերենով, Սպաներենով եւ Վիեթնամերենով:
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