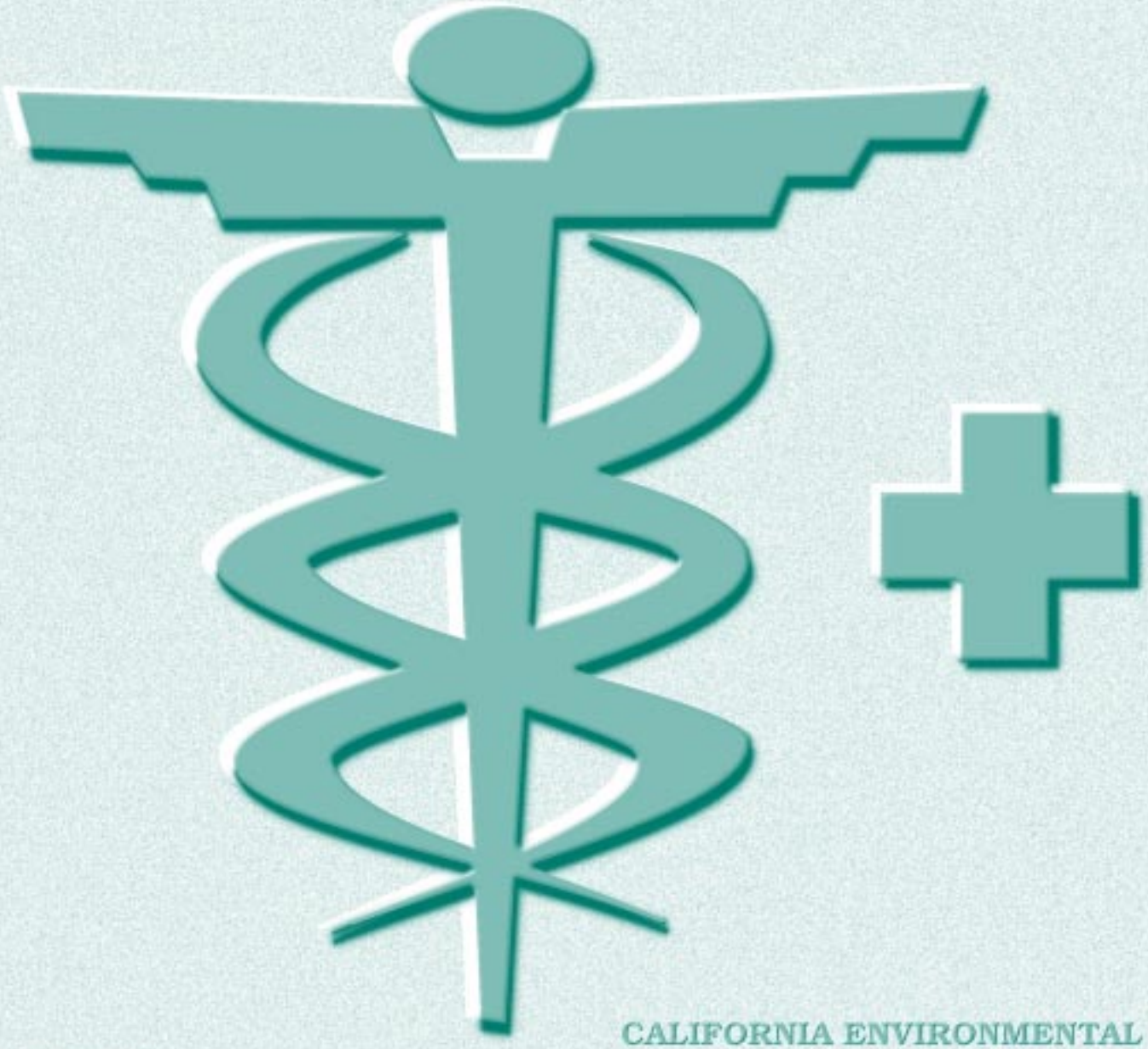
# POLLUTION PREVENTION GUIDE FOR HOSPITALS

(excluding medical wastes)



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CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

OFFICE OF POLLUTION PREVENTION AND TECHNOLOGY DEVELOPMENT

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## ACKNOWLEDGEMENTS

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## SOURCES OF CASE STUDY ABSTRACTS

Children's Hospital of Los Angeles / Los Angeles
City of Hope National Medical Center / Duarte
Kaiser Permanente / Fresno
Kaiser Permanente Medical Group Regional Lab / Berkeley
Los Angeles County King-Drew Medical Center / Los Angeles
University of California Davis Medical Center / Sacramento

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The mention of commercial products, commercial services, their sources or their use in connection with material, herein, is not to be construed as actual or implied endorsement of such products or services by the Department.

## MEDICAL WASTE

Information on Medical Waste (including biohazardous and sharps waste) is available from the Department of Health Services, Medical Waste Management Program, P.O. Box 942732 (MS 396), Sacramento, California 94234-7320. Their telephone number is (916) 327-6904 and their fax number is (916) 323-9869.

## *REFERENCES*

"Best Management Practices for Laboratories", "Best Management Practices for Hospitals and Medical Facilities" - Regional Water Quality Control Plant, 2501 Embarcadero Way, Palo Alto, California, 94303, (415) 329-2598.

Contra Costa County Health Department - Hazardous Materials, Martinez, California, 94553-2295, (510) 646-2286, FAX 646-2073.

"Guides to Pollution Prevention - Selected Hospital Waste Streams" - EPA/625/7-90/009, United States Environmental Protection Agency, Center for Environmental Research Information, Cincinnati, Ohio, 45268, (513) 569-7562.

"RX for a Healthy Environment" - San Francisco Water Pollution Prevention Program, Department of Public Works, Bureau of Environmental Regulation and Management, Water Pollution Prevention Program, 1997, (415) 554-3421.

"The California Waste Exchange" - Department of Toxic Substances Control, Hazardous Waste Management Program, P.O. Box 806, Sacramento, CA, 95812-0806, (916) 422-4742, FAX (916) 327-4495, or for online access contact http://www.calepa.cahwnet.gov/dtscdocs/cawastex.txt

"The Case Against Mercury: Rx for Pollution Prevention" - Terrene Institute, Washington, D.C., (703) 548-5473.

"Waste Audit Study, General Medical and Surgical Hospitals" - Ecology and Environment, Inc., for the Department of Toxic Substances Control, August 1988, (916) 322-3670, FAX 327-4494.

"Writing a Waste Reduction Plan for Health Care Organizations" - The University of Tennessee Center for Industrial Services, Nashville, Tennessee, 37219-1804, (615) 532-8657, FAX 532-4937.

# TABLE OF CONTENTS

## FURTHER INFORMATION

## TABLES

# INTRODUCTION

This Guide was developed by the Office of Pollution Prevention and Technology Development to assist general medical and surgical hospitals in evaluating their operations for waste minimization opportunities. The Guide contains three sections. Section 1 will help you evaluate your facility for waste minimization opportunities. Section 2 is comprised of tables listing the waste minimization options from Section 1 and the following four areas for evaluation:

* Waste Minimization Hierarchy (WMH)
* Implementation Potential (IP)
* Type of Option
* Cost of Option

Each of these areas have different point values which will be explained in Section 2. The total scores of the options will allow you to prioritize the options. Section 3 is an economics worksheet to help you decide which options are cost-effective for implementation.

Waste minimization consists of source reduction and recycling, the first two elements of the preferred waste management hierarchy. The waste management hierarchy consists of source reduction, recycling, treatment, and residuals disposal. Addressing waste management using the hierarchy can help save money by reducing the amount of hazardous wastes you have to manage. Waste minimization can involve simple and easily implemented strategies, or complex, state-of-the-art technologies. The extent to which you implement a hazardous waste minimization program depends upon your hospital's particular operations and procedures.

Waste minimization can help you achieve compliance with regulatory requirements by reducing the generated wastes. In some instances, it might even allow generators to avoid specific regulatory requirements. Waste minimization may also help reduce the fees assessed by publicly owned treatment works (POTWs) by reducing your loads on their treatment systems.

## HAZARDOUS WASTE SOURCE REDUCTION AND MANAGEMENT REVIEW ACT OF 1989 (SB 14)

SB 14 required generators who produced more than 12,000 kilograms (13.2 tons) of hazardous waste or more than 12 kilograms (26 pounds) of extremely hazardous waste in 1990 to have prepared two key documents by September 1, 1991. This evaluation and document preparation deadline repeats every four years (September 1, 1995, 1999, 2003, etc.) The Source Reduction Evaluation Review and Plan (Plan), identifies all major hazardous waste streams at the generator's site and evaluates options for reducing or eliminating hazardous waste generation at the source. The Hazardous Waste Management Performance Report (Report) assesses the effectiveness of hazardous waste management previously implemented by the generator, including an assessment of recycling and treatment activities.

The intent of SB 14 is to promote hazardous waste source reduction by requiring a waste stream audit, and source reduction evaluation. SB 14 leaves selection of both technically and economically feasible source reduction measures up to the generator. Whenever source reduction is not practical, the generator is encouraged to recycle hazardous waste and treat any residuals prior to disposal in a manner that will pose the least impact on both public health and the environment and meet applicable treatment standards.

It was the decision of DTSC to compile a "Pollution Prevention Guide for Hospitals". Plans and Reports were called in from those hospitals that fell under SB 14. This was done in order to determine their largest waste streams and to see what source reduction measures were being successfully implemented by hospitals. DTSC's manifest database was used to find those hospitals that needed to prepare Plans and Reports. DTSC's Manifest Unit receives manifests that are sent by hazardous waste generators, haulers, and disposal facilities during hazardous

waste transportation and disposal. Most hospitals are subject to SB 14 because of California Waste Code 541, the photochemicals / photoprocessing waste generated from X-ray development. Some of the facilities responded that they were not covered by SB 14. To substantiate their claims, they submitted a Declaration of Exclusion form to DTSC. Most facilities were unaware of SB 14. Still others had heard of SB 14 but had not prepared the required source reduction documents. These facilities were brought into compliance and their documents were reviewed.

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Plans and Reports were reviewed from the following hospitals and medical facilities.

Cedars-Sinai Medical Center / Los Angeles
Children's Hospital of Los Angeles / Los Angeles
City of Hope National Medical Center / Duarte
Desert Hospital / Palm Springs
Eisenhower Medical Center / Rancho Mirage
Kaiser Permanente / Fresno
Kaiser Permanente / Hayward
Kaiser Permanente / Martinez
Kaiser Permanente / Oakland
Kaiser Permanente / Redwood City
Kaiser Permanente / Sacramento (Morse Avenue)
Kaiser Permanente / Sacramento (Bruceville)
Kaiser Permanente / San Francisco
Kaiser Permanente / San Rafael
Kaiser Permanente / Santa Clara
Kaiser Permanente / Santa Rosa
Kaiser Permanente / South San Francisco
Kaiser Permanente / Vallejo
Kaiser Permanente / Walnut Creek
Kaiser Permanente Medical Group Regional Lab / North Hollywood
Kaiser Permanente Medical Group Regional Lab / Berkeley
Loma Linda University Medical Center / Loma Linda
Los Angeles County King-Drew Medical Center / Los Angeles
Naval Medical Center / San Diego
Rancho Los Amigos Medical Center / Downey
Scripps Clinic and Research Foundation / La Jolla
St. Mary Medical Center / Long Beach
University of California Davis Medical Center / Sacramento
Harbor UCLA Medical Center / Torrance

Data was collected from these facilities' Plans and Reports on successful and unsuccessful source reduction, recycling, and treatment measures. The reported data was formatted into abstracts and are in Section One of the Manual. The abstracts only represent those measures reported by the hospitals. Most waste minimization options available for general medical and surgical hospitals involve conversion to digital imaging, recycling of fixer and developer, and recycling or substitution of solvents, mercury products, and batteries.

# SECTION 1: GENERAL WASTE MINIMIZATION INFORMATION

Hospitals generate small quantities of a wide variety of wastes. This contrasts with industrial generators who typically have a few large volume waste streams. Wastes associated with the development of X-rays represent the largest hazardous aqueous waste stream at most hospitals. Hospitals also generate many solvent wastes, and mercury, an extremely hazardous waste.

Major sources of hazardous waste are:

* solvents used in laboratories and maintenance
* formaldehyde used for preserving specimens and cleaning dialysis equipment
* photographic solutions used for developing X-rays
* radioactive wastes
* mercury from blood pressure instruments, thermometers, Cantor and Miller Abbott tubes, thermisters, and fluorescent fixtures
* disinfectants and sterilants
* oxidizers and caustics used for cleaning
* wastes from storage areas like surplus inventory, obsoleteinventory, and leaks or spills
* batteries
* oils from engineering equipment
* chemotherapy wastes

In general, a waste is hazardous if it is toxic, corrosive, ignitable, or reactive. The criteria for determining these hazardous properties are complex. You can find the criteria in Title 22, California Code of Regulations (CCR), Section 66262.10. As an example, silver is considered hazardous if its soluble threshold limit concentration (STLC) exceeds 5 milligrams per liter (mg/l), or if its total threshold limit concentration (TTLC) exceeds 500 milligrams per kilogram (mg/kg). There is an address in the Appendix if you want to request a copy of the CCR. It is the generator's responsibility to use these criteria to find out if their wastes are hazardous. If you are not sure if your wastes are hazardous or need help understanding the criteria, call your local Department of Toxic Substances Control (Department) regional office (telephone numbers are listed in the Appendix). Also, be sure to check your local government or publicly owned treatment works (sewering agency) regulations. They may be more stringent in their requirements.

## DEFINITION OF WASTE MINIMIZATION

Waste minimization consists of waste management approaches that reduce the amount of hazardous waste generated or requiring disposal. Waste minimization includes source reduction and recycling.

Waste minimization can reduce the amount of hazardous wastes generated in your hospital. This benefits you by minimizing:

* disposal costs
* regulatory compliance costs (recordkeeping, reporting, tracking, etc.)
* costs of future liabilities
* current operating costs (i.e., raw material costs)
* transportation costs
* offsite treatment costs
* worker safety costs
* laboratory costs (for compliance with land disposal restrictions)
* fees and taxes
* insurance costs
* occupational exposures (indoor air quality, direct contact)
* storage space costs
* labor costs

Additionally, waste minimization can increase hospital productivity, improve environmental protection, and enhance community relations. These benefits may be realized by your hospital by implementing the following waste minimization methods:

**Source reduction:** is any action which causes a net reduction in the generation of hazardous waste or any action taken before the hazardous waste is generated that results in lessening of the properties which cause it to be classified as

hazardous. Examples include substituting input material or changing production processes to reduce the amount of waste generated. It does not include any actions taken after a hazardous waste is generated, actions that merely concentrate the constituents of the waste to reduce its volume or that dilute the waste to reduce its hazardous characteristics, actions that merely shift hazardous wastes from one environmental medium to another environmental medium, or treatment.

**Recycling:** is the use, reuse, or reclamation of hazardous constituents. Examples include employing onsite or offsite techniques to remove contaminants from a waste stream so that the regenerated material can be reused.

To be successful, your waste minimization program must be organized. It is not hard to organize waste minimization, but you will need to spend a little bit of time at first to get started. Keep in mind the following principles of waste minimization:

### *PRINCIPLES OF WASTE MINIMIZATION*

Identify baseline waste generation rates, current hazardous waste management strategies, and current waste management costs.

Hospital owners and managers must be committed to waste minimization for it to be successful and sustainable in the long run.

Waste minimization programs should include a written policy with specific goals, objectives, and timelines.

Train employees in hazardous waste handling and site specific waste minimization methods.

Be aware of and keep updated on the hazardous materials regulations.

### *ASSESSING WASTE MINIMIZATION OPPORTUNITIES*

This Guide will help you perform a waste minimization assessment. The objective of this assessment is to identify ways to reduce or eliminate waste through a careful review of operations and waste streams. After you select a specific area(s) to focus your waste minimization efforts, a number of options should be developed and evaluated. Evaluate the technical and economic feasibility of the selected options. Finally, select the most promising waste minimization options for implementation.

When performing your waste minimization assessment, the answers to the following questions can help guide your efforts:

Which wastes are classified as hazardous and which are not? What makes them hazardous?

How much of a particular input material enters each waste stream monthly, quarterly, annually, and from what site?

How much of a raw material can be accounted for through fugitive losses and unplanned emissions or discharges?

How efficient is the process in terms of product use, labor use, and space use as it relates to the outcome?

Are unnecessary wastes generated by mixing otherwise recyclable hazardous waste with other process wastes?

What types of housekeeping practices are used to limit the quantity of wastes generated?

What types of process controls are used to improve process efficiency?

### *MANAGEMENT PRACTICES*

Establish a waste minimization program with **strong management commitment**. Ensure a specific person is assigned to oversee the success of the program. This is very important for the long term success of the program. A team with enthusiastic players from each department of the hospital will also help. Have a set waste minimization goal, i.e., a percent reduction for specific wastes. Waste minimization programs are more successful if they contain all of these elements.

In order to accurately assess your waste minimization efforts, you must keep track of the chemi-

cal products that you use. This is referred to as conducting an overall **material balance**. Update your material balances at least annually, or whenever you change your operations or the chemicals you use. (See the EPA "Guides to Pollution Prevention - Selected Hospital Waste Streams" for worksheets to help quantify this data.)

You can reduce the amount of waste generated by spills if you train your employees to properly handle and store hazardous materials and if you instruct them in **optimal spill clean up**, waste will be less. Some local environmental health agencies sponsor employee training seminars. Some consulting firms offer employee training as part of their package of services for hazardous waste management. Employees feel committed to waste minimization when they see their suggestions implemented to eliminate or reduce waste at the source. Be sure new employees are trained.

Developing an **employee recognition program** for pollution prevention ideas can greatly increase staff interest. In addition, if you do implement a pollution prevention concept or feel your hospital has done exceptionally well in implementing pollution prevention, you may qualify for awards or recognition by some local government programs.

Compliance with **local, state, and federal laws and regulations** related to hazardous material storage, treatment, disposal, and recycling is essential to a good waste minimization program. Try to have a process in place for learning which current and proposed laws and regulations may impact your hospital.

Make sure hazardous waste generating departments are billed for all management, compliance, and disposal costs incurred by their activities.

Hazardous waste management costs covered under a general expense fund will not give specific departments any incentive to minimize their wastes. Software is available that will **track inventory** so that you will know everyday, how much waste was generated, what it cost, and whether it was appropriately handled by each department in the hospital.

## MATERIAL SAFETY DATA SHEETS (MSDSs)

The Occupational Safety and Health Administration (OSHA) requires MSDSs for all hazardous materials. These sheets contain manufacturer's information regarding chemical, physical, and toxicological properties of the substance, proper handling and storage procedures, and safety and emergency response procedures.

Consider keeping your MSDSs on a computer-based file. They can be kept up-to-date easily and organized by use rate, toxicity, amount on hand, or whatever system best serves your needs. MSDSs are useful in pollution prevention because they let us know the hazardous constituents of a product. With this information, hospitals can decide whether to switch to something less toxic, if necessary. Employees are required to have access to MSDSs. Review your MSDS library at least annually to assure that you have one for every product that you use, and that the MSDSs you have are the most current editions.

## MATERIALS INVENTORY AND STORAGE

Material inventories are the supplies or materials that are kept on hand for future use. If these supplies are allowed to become too old to use, they may necessitate costly hazardous waste disposal. Obsolete stock can be minimized by proper planning, inventory control, and centralizing purchasing and dispensing.

Consider implementing the concept of having a single point of authorization through which hazardous materials may be requested and received. In addition, start an automated tracking system that begins when a hazardous material is first ordered and continues through receipt, issue, use, and disposition of unused quantities. Additional information about setting up such a system used by the United States Air Force, the **Hazardous Material Pharmacy** concept, can be obtained at http://es.inel.gov/ or by calling (800) 233-4356.

Inventory control is best achieved with the installation of a **computerized inventory system**. By using such a system, inventory can be checked more frequently to determine what is actually used. If more than one department orders the same material, make sure that ordering and use is effectively managed. Individual departments ordering "outside the system" will not allow you to control your inventory. Personal computers will allow you to computerize your inventory and are relatively inexpensive. Contact your supplier or group purchasing organization about getting specific software to optimize tracking. Inventory control is especially necessary for cleaning and surface preparation chemicals (acids, alkalies, solvents), and drugs and chemicals.

Employees should be trained to use the **minimum amount** of chemical necessary to perform a job adequately. Provide engineering controlled dispensing units where applicable.

When appropriate, use the **"JIT" or "Just in Time"** system for ordering materials. By waiting to order materials until they have almost run out, materials are not overstocked and do not become obsolete. Obsolete materials may have to be disposed of as hazardous waste.

**Inspect raw materials** before you accept them. Unacceptable or damaged materials and products may become hazardous waste. Containers that are damaged, have loose-fitting lids, unsealed drum bung holes, and leaky valves may be an indicator of damaged goods inside.

The individual responsible for inventory should **label and date** new material containers as they are received. By labeling all materials clearly with their expiration dates, you can rotate your stock so that the earliest labeled stock is used first. This is often referred to as a "first-in, first-out" (FIFO) policy. If the shelf life is not indicated on the label, contact the supplier. Also, be sure an MSDS is available that explains the proper and safe use of each chemical.

Materials having an **expired shelf-life** should be tested for effectiveness before being discarded. The material may still be usable. Material that no longer has a useful shelf-life is considered a hazardous waste and must be properly disposed.

Conducting quarterly **inventories** of materials in storage will allow you to identify materials that are near the end of their shelf-life, and also check for containers which may leak in the future. Assign an individual to be responsible for specific areas and schedule a full-scale inventory of your raw materials at least once a year.

Storing materials in **reusable containers**, although hard to come by, will allow you to return the empty container to the supplier and reduce the amount of waste you must dispose. Ensure single-trip containers and nonreusable containers are handled according to the regulations.

**Storing hazardous and nonhazardous materials separately** will reduce the risk of a hazardous waste being generated due to a hazardous material leaking and contaminating a nonhazardous material, thereby increasing disposal and clean-up costs. Maintain distance between different types of materials/chemicals (i.e., flammables vs. oxidizers, strong acids vs. bases) to prevent cross-contamination and reactions in case of spills or leaks.

**Heavy traffic** through the raw material storage area increases the potential for contaminating raw materials with dirt or dust and for causing spilled materials to become dispersed throughout the facility.

Dust from solid stored materials may contaminate other stored materials which will then have to be disposed of as hazardous waste. Use a **dust** recovery system if this is a problem in the storage areas.

**Limiting access** to raw materials to designated personnel and centralizing inventory control and delivery will help you reduce the amount of raw materials wasted. You may want to consider a stockroom attendant and sign-out sheet to help control inventory. Never allow more than one person in each department to

order supplies independently of each other as it may cause excess purchases. Consider installing vending machines that require patient and/or employee codes to secure supplies.

**Minimizing the amount of stock** on hand makes it easier to track your usage of materials and keep your supplies from becoming too old to be used. Instead of just reordering the usual quantities or random amounts, try to more accurately order supplies depending on real usage. With smaller containers, there may be less chemical deterioration and smaller volumes of expired materials generated. A substantial portion of laboratory waste is actually surplus reagent and chemicals.

Try to buy chemicals only from manufacturers who will accept their return if their shelf-life is exceeded. If this is currently not available, try to negotiate this feature into future procurement contracts. **Returning obsolete raw materials** can prevent you from having to dispose of them as wastes.

Maintain and enforce a policy of using raw materials only for their **intended uses**. You may generate unnecessary hazardous waste if you use supplies for purposes other than their intended uses. For example, do not use equipment cleaning solvents to clean your floors.

Do not **stack** containers higher than recommended by the manufacturers, or in such a manner where they can tip over, tear, puncture, or break. Also, do not stack equipment against material containers to avoid damaging the containers.

Keep materials and/or wastes in **proper storage** areas. Many photoprocessing and plate developing chemicals are sensitive to temperature and light and should be kept in proper storage areas. Proper storage areas can also help you reduce wastes generated due to spills, cross-contamination, or leaks. Storage areas should include adequate lighting, insulated electrical circuitry (checked frequently for corrosions to prevent potential sparking), and aisles clear of obstructions. Space is often a constrained resource in healthcare facilities. If proper storage space is not available, find out why.

Put in place inventory or other controls to assure that chemicals in a container are completely used prior to opening a new container. **Complete use** of material in opened containers can reduce the amount of wasted raw materials that adds to the total volume of waste.

Provide secondary containment for appropriate supplies/wastes. All microbiology staining supplies should be stored in **secondary containment**. All formaldehyde solutions and specimens stored in free solutions should be stored properly in secondary containment, on secured shelving, and away from sinks. The secondary containment vessel or area (e.g. tray, cannister, or bermed area) should be impervious to the liquid being contained and large enough to hold at least 110 percent of the capacity of the primary container. Secondary containment must not drain to any sewer.

Labs should have standards for minimum volumes necessary for adequate preservation and fixing. Plastic bags can reduce the amount of chemical left in storage with the specimens. Both plastic bag and plastic container use **eliminate breakable storage**. Bags should be stored in rigid secondary containment. Formaldehyde prepared specimen bottles should be purchased in the smallest size that will do the job. Doing so will minimize the amount of formaldehyde used and the waste generated.

### *DRUMS AND CONTAINERS*

Storing drums on **pallets** will raise them off of the concrete floor which will prevent corrosion of the drums through "sweating" of the concrete. Secondary containment pallets should be used for chemical storage.

Empty containers should be returned to the suppliers. Proper management and handling of **empty containers** previously containing hazardous materials can reduce the volume of hazardous waste generated.

Providing **adequate space** between rows of drums will allow for visual inspection of each container for corrosion and/or leaks.

There are two predominant **patterns of drum location** if drum storage is utilized. When

inventory control is necessary to minimize product usage, drums should be stored together. The storage area should have limited accessibility, and should be equipped with indoor or outdoor sheds, storage lockers for flammables, or locking storage rooms.

The second pattern assumes that employees can be trained to take individual responsibility for regulating product use. In this case, inventory control would not be a problem, and it may be more effective to separate drums and place them at points of highest use. This alternative reduces the chance of product leaks and spills during transport from storage to work areas.

An **"empty" container** is one from which all the material possible has been emptied from the container. If the container held a material which could be readily poured (i.e., cooling tower treatment chemicals, X-ray chemicals, or cleaning and disinfection products), all material must be removed by any practicable means (including pumping, aspirating, and draining) by the generator before the container can be considered empty. If the container held nonpourable materials, no material shall remain in the container that can feasibly be removed by physical methods including scraping and chipping. This standard applies to materials that pour slowly or do not pour at all from the container like viscous materials, solids that have "caked up" inside the container, and nonpourable sludges. Containers that held acute or extremely hazardous waste are considered empty if the container has been triple rinsed using a solvent capable of removing the material or cleaned by another method that is proven to achieve equivalent removal to triple rinsing.

Empty containers of five gallons or less in capacity can be managed by one of the following methods: 1) by disposing the container at an appropriate solid waste facility, 2) by reclaiming the container's scrap value onsite or by sending the container to a person who reclaims the container's scrap value; or 3) by reconditioning or remanufacturing the container onsite, or by shipping the container to a person who reconditions or remanufactures the container.

Containers larger than five gallons in capacity shall be marked with the date they have been emptied and shall be managed within one year of being emptied by one of the following methods: 1) by reclaiming the container's scrap value onsite or by sending the container to a person who reclaims the container's scrap value; or 2) by reconditioning or remanufacturing the container onsite, or by shipping the container to a person who reconditions or remanufactures the container.

### *SPILL CONTROL*

Spills are inadvertent discharges that occur at various places in a facility. Spills include accidental tipping over of containers, and dropping and breaking of containers as well as spills which occur mainly because of splashing during manual transfer, overfilling, and leaks in process equipment and piping. Encourage the reporting of all spills. Educate employees on what hazardous wastes are so that spills can be reported. In the past, many employees did not realize mercury was an extremely hazardous waste and would rinse the mercury from broken thermometers down the sink. Although you may only have a few small spills, spill control can help you reduce wastes generated by unnecessary cleanups.

**Lift drums** by means of powered equipment or hand trucks. Under no circumstances should drums be tipped or rolled, even when empty. Negligent handling may damage the seams, resulting in future leaks or ruptures.

**Scoop spills** up to the fullest extent possible. The spilled materials can then be reworked into product. Spills that cannot be retrieved should be cleaned up with commercially available absorbents and disposed of in accordance with all local, state, and federal regulations. Use a squeegee for recovery of liquid spills.

Regulations require **spill containment** around waste and material storage areas to minimize the spread of any spilled material. Providing spill containment like curbs, dikes, or berms around process storage tanks and waste storage areas can minimize the amount of cleanup

materials needed to contain and clean up spills. Spilled hazardous materials become hazardous waste and must be managed as such.

Periodic drills can improve the readiness and effectiveness of employees in dealing with **emergency situations**. Be sure employees know where emergency phone numbers and clean-up kits are located. Remember, training your employees is also a legal requirement.

Some spills will occur. Keep a record of larger spills (when and why they occur). Use this information to identify the **spill prevention** options that might help your hospital. Many of these options are listed throughout the checklist. Remember, minimizing spills helps to reduce the amount of cleaning material you use, and reduces the amount of hazardous spent absorbent and used floorwash you generate.

Prevent leaks via proper **equipment maintenance**. Increased training and closer supervision can prevent overfilling and spills during manual transfer.

Hazardous materials and wastes should be pumped from drums to smaller containers using spigots, pumps, piping, or funnels. Never pour them directly from drums to smaller containers. The potential for spills and leaks is highest at the point of **product transfer** from bulk drum storage to process equipment.

Periodic **inspections of tanks** will detect corrosion or deterioration before a spill occurs. For large stationary tanks, hire a person qualified to make these inspections, if necessary.

Maintaining **clear and even surfaces** in storage areas used by personnel when moving materials or equipment will help decrease the incidence of spills due to accidents.

Glassware and other containers should be stored on textured rubber mats to limit breakage when they fall. Order **chemicals** in plastic coated bottles whenever possible. Use plastic or insulated holders for solvent bottles. Never store chemicals above sinks on shelves or in cabinets. Store in approved chemical cabinets or on low shelves. Always latch doors on chemical storage cabinets. Install secondary containment trays when there is a sink in the area to ensure spilled chemicals do not go down the drain. Secondary containment is best for all storage to contain leaks and spills, especially as an earthquake measure. Secure chemicals stored on shelves or in cabinets behind barriers if secondary containment is not feasible. Barriers should be at least 1/5 the height of the tallest container. Segregate incompatible chemicals to prevent mixing in case of an accidental spill. This can be accomplished by using separate storage cabinets and closets or physical barriers such as independent secondary containment, berming, or trenching.

# HAZARDOUS WASTE MINIMIZATION—APPLICATIONS

## FACILITIES

### AEROSOL CONTAINERS

#### Use and Storage

Aerosol containers are present in the facility maintenance areas in health care organizations. Empty aerosol containers which did not previously hold acute or extremely hazardous waste are exempt from regulation. However, full or partially full aerosol containers with expired shelf-life must be disposed as hazardous waste. Aerosol containers which are not emptied to the maximum extent practical (due to a clogged nozzle, for example) will not qualify for exemption and should be managed as hazardous waste.

Discourage the use of aerosols. If aerosol purchases seem to be large in quantity, investigate and identify which activities use the most. Focus your waste reduction efforts on the high volume uses. Request products from the manufacturer in recycleable non-aerosol pump sprayers, pressurized or nonpressurized. Order products according to demand and dispense aerosol containers when an empty container is returned. This process should be controlled through one person in one location to prevent unnecessary usage.

To increase the shelf-life of aerosol containers, keep them away from moisture, sunlight, and extreme heat and cold. It is also important to keep protective caps on the containers when not in use. This helps prevent contamination, rusting of the container top, and nozzle damage.

#### Recycling

Facilities are available that recycle aerosol containers. If they do not offer pick-up services, see what options are available to send your aerosol containers to them. If you generate enough aerosol container waste, investigate the purchase of an onsite recycling unit. In the future, the Department may be certifying recycling units that allow the user to be exempted from the standardized permitting process.

## BATTERIES

**Alkaline manganese batteries** are hazardous because of the zinc present, but they are now available in rechargeable form (1.5 volts, AA, AAA,C,D). Eight batteries can be recharged at a time. Manufacturers are working to increase the size of the battery rechargers. These batteries can replace nickel-cadmium or silver-cadmium batteries. Some uses for these batteries are in cameras, pagers, and flashlights. Rechargeable alkaline manganese (RAM) batteries can be used as a replacement if you require a long shelf life, frequent use, or don't need more than 400 milliamps of current.

**Nickel-cadmium batteries** are hazardous because of the nickel and cadmium present. Nickel-cadmium batteries are found in alarm systems, backup power sources in medical monitors, and equipment. These batteries are often rechargeable, but need eventual disposal. Silver cadmium batteries are in medical electronics. These batteries contain silver and cadmium and must be disposed of as hazardous waste.

**Mercuric oxide batteries** are hazardous because of the mercury present. These batteries are typically used in hearing aids, smoke detectors, oxygen monitors, fetal monitors, and portable EKG monitors. They must be disposed of as hazardous waste.

**Lithium batteries** are hazardous and must be disposed of as a hazardous waste. Lithium batteries can be recycled. This is cheaper than having them manifested and disposed of as hazardous waste. Lithium batteries are found in glocometers, cameras, and other devices.

**Zinc-air batteries** are hazardous because of the zinc present but they may be used to replace mercuric oxide batteries which are more hazardous. Mercuric oxide batteries contain zinc and mercury. These batteries are typically found in hearing aids and electronic pagers.

Careful consideration is necessary when evaluating the use of rechargeable batteries in health

care settings. They are not appropriate in all situations, especially those involving life saving equipment where a partially recharged battery could result in equipment failure and death.

#### Collection and storage

Convenient collection points will ensure that batteries are not inadvertently discarded in the biohazard, solid, and other recyclable waste streams. Lead acid automotive batteries used in diesel generators and helicopters need to be properly stored, preferably In secondary containment until sent out for recycling. They should not be left outside, especially near a drain.

## CONSTRUCTION

#### Carpet, flooring, counter top materials

Before installing carpet, consider the treatment area, e.g., no carpeting in chemotherapy areas. If solvents are to be used, like in a lab, keep in mind that many flooring and counter top materials are not resistant to solvents. Give a list to the contractor of those chemicals to which the surfaces will be exposed. Remember that once these surfaces are contaminated, they must be removed and handled as hazardous waste.

#### Halon fire extinguishers

There is a ban on the manufacture and importation of halon fire extinguishers, but not on their use. Substitutes are available. If your hospital is equipped with halon extinguishers, develop a replacement plan to eliminate these devices from your facility. For additional information on halons and their substitutes, contact the United States Environmental Protection Agency, Office of Air and Radiation, Stratospheric Protection Division, Mail Code 6205J, 401 M Street, SW, Washington, D.C. 20469 or call the Ozone Protection Hotline Toll-free (800) 296-1996 or at (202) 775-6677.

#### Sprinkler Systems

New construction may require additional sprinkler systems, especially in hazardous waste storage. Some local fire departments require that new construction have a sprinkler system that can hold twenty minutes of sprinkler water plus 110 % of the chemical contained there.

## HOT WATER SYSTEMS

Hospitals often add extra disinfectant processes to their hot water systems. Common alternatives include elevated temperatures, additional chlorine, or a copper silver electrolysis system. When using elevated temperatures, control the temperature by only having intermittent high temperatures rather than than keeping it continuously elevated. Constant elevated temperatures will lead to more corrosion. If using chlorine, be sure chlorine addition is optimized to provide adequate controls while avoiding overdosing. Electrolysis systems, which add copper and silver to the waste water, may lead to an increased amount of these metals within the system. Other corrosion controls can include reduced or protective magnesium anodes, alternate piping materials, slower recirculating rates, pH adjustment, and chemical controls such as adding sodium bicarbonate.

## HOUSEKEEPING

#### Zinc

Check the labels on products to verify what chemicals they contain. Floor waxes, wax strippers, stainless steel cleaners, brass polish, and lubricants often contain zinc and should be eliminated.

#### Tributyl Tin

Tributyl tin, found in mildew controlling carpet shampoos, toilet cleaners, and germicidal surface cleaners should also be avoided. It will be listed as tributyl tin chloride, tributyl tin neodiconate, bis tributyltin oxide, tributyle tin benzoate, etc.

#### Phenolic Compounds

If phenolics are used, the minimum required concentration should be mixed. Quaternary amine substitutes may be suitable and are less likely to cause discharge problems. However, both types should be handled as hazardous materials. Working strength and used solutions may or may not be hazardous waste. Use premeasured doses, pumps, and auto-feed systems to minimize the use of these products. Phenolics should not be used in areas where infants and toddlers reside.

## LAUNDRY

### Hazardous Waste

Educate staff to recognize and separate out hazardous materials before doing the laundry. Mercury thermometers, mercury blood pressure devices, and Miller Abbott tubes are hazardous wastes. Rags used to clean up hazardous spills are also hazardous waste and need to be properly disposed of.

### Laundry Chemicals

Optimizing the use of laundry chemicals and minimizing accidental spills is achieved through worker training, prepackaged laundry chemicals, or the use of an automated laundry chemical feed system. While laundries might incur initial capital costs to install an automated system, the savings from optimal chemical usage and reduction in labor costs may have long term benefits. Receive laundry chemicals in totes (bulk dispensers) rather than the usual 5 gallon containers.

### Tunnel Washers

Tunnel washers significantly reduce water usage because they use the rinse water from the final rinse for the initial wash.

## LIGHTING

### Replacements and Recycling

Replace mercury vapor street lamps, fluorescent, high intensity, and ultraviolet lights with ordinary glow lights, low sodium vapor tubes (yellow), opticals, high-energy, and long-lasting lights and recycle when possible. This can greatly reduce the amount of mercury waste. Although no effective substitute exists for high energy fluorescent tubes, recycling systems are in place. U.S. EPA's Green Lights Program is a good source of information about alternative applications in this area. The U. S. EPA Office of Air and Radiation operates the Federal Green Lights Program. If you are using fluorescent lights, this program can help you. Many health care organizations have reduced costs significantly by using a combination of T-8 lamps with electronic ballasts, compact fluorescent, and other proven lighting technologies. The internal rate of return for hospitals from lighting upgrades can be as much as 50 percent and savings of up to $100,000 are typical for a 400,000 square foot hospital. To participate in the Green Lights Program, contact Manager, U. S. EPA (6202J), Washington, D.C., 20460, Fax (202) 775-6650, Phone (202) 775-6650. If you are a small medical building and do not have enough fluorescent tubes to warrant pickup, perhaps you can combine with other facilities or large institutions, and establish a milkrun to deliver a large quantity for recycling.

## OFFICES

### Laser Jet Cartridges

Laser jet cartridges can be recharged and purchased back for one third less of the original costs.

## PAINTS

### Water-Based Paint

Replacing oil-based paints with water-based paints in facility maintenance operations will eliminate the use of solvents and thinners as cleaners. Water-based paints must still be handled as hazardous waste. Using paints without metal pigments or paints with high solid, low volatile organic compounds will also help reduce hazardous waste. Include these requirements when developing service contract bids.

### Proper Handling

Paint residues or wash waters from cleaning equipment should not be washed into street gutters or storm drains. Solvents and thinners used with oil-based paints should be filtered and reused. Allow the solids in the solvents and thinners to settle and decant the liquid cleaning solution. Off-specification paint can be used as utility paint. Extra paints, solvents, and paint residue that cannot be reused or recycled must be managed as hazardous waste. Purchase paint only in needed quantities, do not mix more paint than is needed for a job, and standardize paint colors used in the facility. Chemical paint-stripping waste is always hazardous.

### Over-Spray

Over-spray is the paint that does not reach the part. Over-spray creates waste and increases raw materials cost. To reduce over-spray, use spray system equipment with high transfer efficiency. High volume, low pressure (HVLP)

guns provide the highest transfer efficiency. Electrostatic spray guns also improve transfer efficiency. Maintain proper pressure as identified in the operator's manual for specific gun systems. Higher pressures contribute to overspray. Replace damaged nozzles. Keep the spray gun perpendicular to the surface and maintain a fifty percent overlap of spray pattern. Maintain a gun distance of six to eight inches from workpiece. Trigger the spray gun at the beginning and end of each stroke. Use heaters to reduce paint viscosity instead of adding thinners.

### PAINT GUN WASHER AND RECYCLER

Paint guns are often washed manually with paint thinner. A paint gun washer and recycler can reduce the amount of thinner waste as shown in the following case study.

### PARTS WASHING

#### Alternatives

There are petroleum distillates available that are nonhazardous (non-ignitable) because the product has been formulated so that the flash point is 140 degress Farenheit or greater. Hot soap cleaners are very effective for parts washing. Oil skimmers can recover oil before water is discharged to the POTW. However, consult with wastewater authorities to determine if any local limits restrict hot soap wastewater discharges. Evaluate whether all maintenance functions that require cleaning are compatible with ketone, ester, or aqueous-based cleaning technologies. (For additional information on how to go about selecting aqueous cleaners, order a copy of publications 608 and 609 in the "Publications List" in the Appendices.)

**Paint Gun Washer And Recycler Case Study**

Company Name: Los Angeles County-King/Drew Medical Center
SIC Code: 8062/General Medical and Surgical Hospitals
Business Activity: Provides personal health services to the Los Angeles County population.
Waste Stream/CWC: Paint Waste/CWC 214
Quantity of Waste (yr-lbs): 1994-1750 lbs
Process Generating the Waste: The paint gun in the paint shop was washed manually with thinner.
Estimated Source Reduction (lbs/%): 500 lbs/28%
Source Reduction Approach/Measure: Production Process Change
Brief Description of Measure: Replace the manual method with a paint gun washer and recycler that uses compressed air. The washer re-uses the thinner for washes, reducing the generation of thinner waste.
Implementation Date: A Herkules Paint Gun Washer and Recycler was installed in the paint shop in mid-1994.

Economic Overview
Capital Cost: $975
Cost of Operation and Maintenance: $100/year
Cost of Thinner Used: $312/year
Cost of Disposal of Thinner Waste: $175/year
Discharge Impacts to Air, Water, and Land: In the manual method, thinner vapor emits into the surrounding work space. In contrast, the washer is covered while in operation, and the emission of thinner vapor is minimized. Practically all the used thinner is captured as liquid waste. This reduces the risk of employee exposure to harmful thinner vapor.
Comments: The washer cleans the paint gun very well consistently and is a technically feasible and economically practicable source reduction measure.

### *Solvent Parts Washer Stations*

Do not locate solvent parts washer stations near exhaust fans and door drafts. Pumps that are continuously running volatilize product into the air. Make sure parts washers are off when not in use. If the parts washers have lids, keep the lids closed when the washer is not in use. Efficient operating procedures for parts washing in maintenance areas can help eliminate some solvent wastes. For example, do not have more parts washer stations than necessary. Do not allow unnecessary "pick-ups". By having more frequent pick-ups, you may increase your generation rate - the amount of hazardous waste generated in any one calendar month. This could unnecessarily change your status from small quantity generator to large quantity generator and increase your permitting fees and related requirements.

## *PESTICIDES*

Pesticides in general are not hazardous waste unless they are improperly stored or disposed of. If not used safely or appropriately, they can become an unnecessary hazard. The key element to ensuring good pesticide management is having one person in charge of all pesticides. In addition, a log should be kept of where and when pesticides are used. Even if a contractor is providing services, a log should be required to track the pesticides. Reduce pesticide inventories toward a goal of just-in-time and prepare and use only the required quantities. Segregate dry products from liquid products to prevent mixing of products if spilled. Use non-chemical pest control methods. Ensure that areas where children reside and receive care have minimal and least toxic applications. Consider using contract services for insect control, rodent control, and lawn maintenance. Specify in your bid for services the need to use less toxic pesticides and require the contractor provide all pesticide products and remove all containers from the site. Source reduction and proper management of these wastes may be more efficiently managed by a contractor. Contact your local county agricultural commissioner, the University of California Extension office, or the Department of Pesticide Regulation for further information. Additional publications are also listed in the Appendices.

## *PLUMBING*

### *Sewer Lines, Traps, and Sumps*

Mercury is often present in sewer lines, drains, traps, and sumps as it may have been discarded in this manner over the years. Caution should be taken to avoid spilling the contents in case mercury is present. Non-water contents must be handled as hazardous waste unless proven otherwise.

## *LABORATORIES*

Hospitals often have several types of labs. They may include research and teaching labs, minilabs in outpatient care offices, chemistry, hematology, pathology, microbiology, immunodiagnosis, and gross pathology and necropsy labs. There are numerous laboratory operations in hospitals and medical facilities that are sources of hazardous wastes. So many lab waste solutions contain significant concentrations of metals and other chemicals that it would be practically impossible to list all of the hazardous wastes of concern.

Solvents are the predominant waste of labs. Solvents are used for fixation and preservation of specimens in histology and pathology, and for extractions in laboratories. Halogenated solvents are generally more toxic and persistent than nonhalogenated solvents. Halogenated compounds used in hospitals include methylene chloride, chloroform, tetrachloroethylene, chlorobenzene, trichloroethylene, 1,1,1 trichloroethane, and refrigerants. Nonhalogenated compounds include xylene, acetone, toluene, methanol, ethyl ether, methyl ethyl ketone, and pyridine.

Routine procedures for managing solvent wastes at some hospitals currently include discharge to the sewer and lab-pack disposal in landfills. These are no longer advisable and in some situations may be illegal.

## *INVENTORY*

Once a lab has completed its use of a chemical, it can be returned to supply. When another lab requests the chemical, supply should give them the unused portion first. By sharing chemicals between laboratories, it may reduce the amount of chemicals purchased as well as disposal costs.

### *CLEANING*

Replace alcohol-based disinfectants with **sonic or steam cleaning**. Substitute specialty detergents for chromic acid and sulfuric acid for cleaning laboratory glassware. Use **biodegradable detergents and/or aqueous reagents** as a cleaning substitute where possible. In some cases, as with highly infectious agents, powerful cleansers are still essential.

Conduct the initial cleaning with used solvent and use fresh solvent only for the final cleaning. This is known as **countercurrent cleaning** and decreases the amount of reagent solvent used.

A wide variety of solvents means there will be a wide variety of waste streams to manage. Investigate the possibility of using **one type of solvent** for equipment cleaning. By switching to one type of solvent, it may be cost effective to have onsite distillation.

Before labware is placed in the autoclave for cleaning and sterilization, the chemicals in the labware need to be drained out and collected in proper disposal receptacles. This can significantly reduce the amount of contaminated wastewater entering the POTW system as shown in the following case study.

**Autoclave Labware Washing Process/Laboratory Clarifier Case Study**

Company Name: Childrens Hospital Los Angeles
SIC Code: 8060/Acute Care Hospital (Pediatric)
Business Activity: Licensed acute care pediatric hospital with school of physical therapy, medical technology, and x-ray technology (USC affliation).
Waste Stream/CWC: Lab Chemicals/CWC 551 and oil/water separations/CWC 222.
Quantity of Waste (yr-lbs): 1995 - 46,451 lbs
Process Generating the Waste: Autoclave labware washing process/laboratory clarifier
Source Reduction Approach/Measure: Production Process Change
Brief Description of Measure: Prior to changing the labware cleaning process all excess waste in the labware was put through the cleaning systems with disregard to chemicals ending up in the clarifiers, which would result in the pumping, cleaning, and bleaching of the clarifier system. This process change is twofold:

1. Analysis and evaluation to assess how oils, lab chemicals, and solvents enter the industrial wastewater clarifier.
   A. Analysis showed chemical residues from the labware cleaning process entered the wastewater system. Monthly clarifier pumping and cleaning with hot water and bleach was used to reduce hydrocarbon build-up prior to the implementation of this process change (in1994-95) resulting in a waste stream that needed to be kept from entering the local POTW outlet (sewer).
   B. A training program was initiated to ensure chemical wastes and residues were collected in proper disposal receptacles and then labware was placed in autoclave for cleaning and sterilization.
2. In mid-year 1995, hydrocarbon-reducing enzymes were introduced into the clarifier system to reduce hydrocarbon effluents and to alleviate the need for pumping and cleaning the clarifiers monthly.

Implementation Date: 1995-96 Fiscal Year

Economic Overview
Capital Cost: No capital outlays were needed.
Maintenance/Recurring Costs: Reduction of pumping costs of $1950.00 per month. The enzyme product (Neozyme's EcoSystem Plus) costs $205.00 per quarter ($820.00/yr.)
Return on Investment: Savings of $1881.67/month.
Discharge Impacts to Air, Water, and Land: Reduction of 46,541 pounds per year of contaminated wastewater entering the POTW System. Reduction of hydrocarbon VOC contaminants to the air.
Barriers/Obstacles: Education and training in pre-wash procedures encountered.
Comments: Childrens Hospital is also using this enzyme product in the laundry clarifier to reduce any effluents and build-ups occurring in this waste stream also.

### *MERCURY*

**Tungsten** can be substituted for mercury when GI tubes are weighted with a heavy metal for x-ray analysis in the pathology lab.

**Alcohol (red) and digital thermometers** are available as substitutes for mercury thermometers for equipment such as lab ovens and water baths.

### *CELL SORTING AND COUNTING INSTRUMENTS*

Manufacturers are currently working on systems that replace the cyanide in cell sorting and counting instruments with sodium laurel sulfate. Staff should discuss these issues with vendors and be aware of less toxic reagent systems for this and other equipment as they become available.

### *AUTOMATED SYSTEMS OR OTHER INSTRUMENTATION FOR LAB CHEMISTRY ANALYSES*

Evaluate all lab chemistry analyses as to whether they can be run on automated systems or other instrumentation. Advantages of such systems over "test tube scale" procedures are that they use very small volumes of samples and reagents and increase productivity. An automatic slide stainer can reduce the generation of alcohol waste and save labor costs as shown in the following case study.

**Automatic Slide Stainer Case Study**

Company Name: Los Angeles County-King/Drew Medical Center
SIC Code: 8062/General Medical and Surgical Hospitals
Business Activity: Provides personal health services to the Los Angeles County population.
Waste Stream/CWC: Laboratory Waste - Alcohols/CWC 212/214
Quantity of Waste (yr-lbs): 1994-4660 lbs
Process Generating the Waste: Slides with blood smear were dipped into stains by hand.
Estimated Source Reduction (lbs/%): 366 lbs/7%
Source Reduction Approach/Measure: Production Process Change
Brief Description of Measure: Install an automatic slide stainer in the Hematology Laboratory. The automatic slide stainer sprays the slides with the stains, minimizing the generation of alcohol waste. The manual process takes 12 to 15 minutes and the machine takes less than 10 minutes.
Implementation Date: A Wescor Aerospray Hematology Slide Stainer was installed in January 1995.

Economic Overview
Capital Cost: $6000
Maintenance/Recurring Costs: $600/year
Return on Investment
Savings in Chemicals: $930/year
Savings in Waste Disposal: $50/year
Savings in Labor Cost: $9125/year
The use of the automatic slide stainer is estimated to save a minimum of 1 person-hour per day. Since the Hematology Laboratory operates 365 days/year, it is estimated to save at least 365 person-hours/year. The labor cost for a person-hour of a technician is estimated at $25.
Discharge Impacts to Air, Water, and Land: The automatic slide stainer reduces the emission of methanol vapor into the air and the amount of alcohol waste generated because it is covered while the staining is in operation. This also reduces the risk of employees being exposed to methanol vapor. In contrast, the containers of the staining agents are open in the manual process.
Barriers/Obstacles: The machine can replace the manual staining process for most slides with the exception of bone marrow slides, which require a longer period of time. The bone marrow slides need to be done manually.
Comments: The slides prepared from the automatic slide stainer are comparable to the manual method and its use is a technically feasible and economically practicable source reduction measure.

## *MICROANALYTICAL TECHNIQUES*

Evaluate whether experiments can be accomplished using microanalytical techniques. This can reduce the raw materials used and hazardous waste disposal costs as shown in the following case study.

**Microanalytical Techniques Case Study**

Company Name: City of Hope National Medical Center - Duarte
SIC Code: 8062
Business Activity: Cancer Hospital and Medical Research
Waste Stream/CWC: Dichloromethanol/methanol/ CWC 214
Quantity of Waste (yr-gal): 1993 - 20 gallons per month
Process Generating the Waste: Lab experiments measuring DNA Damage
Estimated Source Reduction (gal/%): 15 gallons/ 75%
Source Reduction Approach/Measure: Production Process Change
Brief Description of Measure: Conducted an overall reduction in scale of, and the glassware size used, in experiments. Additionally, purchased equipment which lends itself to microanalytical techniques. Thin layer chromatography equipment was replaced with gas chromatography mass spec equipment.
Implementation Date: 1993

Economic Overview
Capital Cost: $93,000
Maintenance/Recurring Costs: None
Return on Investment
Savings on waste management - $1050 per year
Savings on raw materials - $3445 per month
Total Savings: $42,390 per year. After 2.2 years payback on capital costs.
Barriers/Obstacles: Initial high cost of purchase of new equipment.

## *CARBON DIOXIDE AS A LABORATORY EUTHANIZING AGENT*

Carbon dioxide can be substituted for ethyl ether as a laboratory euthanizing agent. This can be successful as shown in the following case study.

**Carbon Dioxide As A Laboratory Euthanizing Agent Case Study**

Company Name: Childrens Hospital Los Angeles
SIC Code: 8060/Acute Care Hospital (Pediatric)
Business Activity: Licensed acute care pediatric hospital with school of physical therapy, medical technology, and x-ray technology (USC Affliation).
Waste Stream/CWC: Ethyl Ether/221
Quantity of Waste (yr-gal): 1995-18 Gals.
Process Generating the Waste: Laboratory euthanizing agent.
Estimated Source Reduction (%): 90% reduction from 4 years previous. 1997 phase-out of ethyl ether use.
Source Reduction Approach/Measure: Input Change
Brief Description of Measure: All laboratory euthanizing takes place using carbon dioxide.
Implementation Date: 1995-96

Economic Overview
Capital Cost: No capital costs involved.
Maintenance/Recurring Costs: Switch to carbon dioxide from ethyl ether: 4 x 4 liter approximately $150.00 vs. 2 x 80 lb. cylinders of carbon dioxide approximately $19.50 per cylinder = Approximately $111.00 in savings in use differential.
Return on Investment: Unknown. Substantial cost difference between chemicals. Increased safety and human health. A large reduction of extremely hazardous substance reporting and environmental effect.
Discharge Impacts to Air, Water, and Land: None
Barriers/Obstacles: Project implementation and protocol changes for non-change chemical users.
Comments: Ethyl ether use has compounded Childrens Hospital's local reporting requirements and is not that beneficial of a chemical. There are other types of hazards for carbon dioxide usage, but the trade-offs are inconsequential or very low when compared to the health and environmental effects of ether use.

### *CHLOROFORM*

Substitute chloroform with dichloromethane in lab phase extractions. This can be an effective substitute as shown in the following case study.

**Substitute Chloroform With Dichloromethane In Lab Phase Extractions Case Study**

Company Name: City of Hope National Medical Center - Duarte
SIC Code: 8062
Business Activity: Cancer Hospital and Medical Research
Waste Stream/CWC: Chloroform/CWC 214
Quantity of Waste (yr-liters): 1993 - 40 liters per year
Process Generating the Waste: Lab phase extractions
Estimated Source Reduction (%): 100% for chloroform
Source Reduction Approach/Measure: Input Change
Brief Description of Measure: Substituted chloroform (OSHA PEL TWA 50 ppm) with dichloromethane (OSHA PEL TWA 500 ppm). Also, chloroform is a CAL OSHA regulated carcinogen, dichloromethane is not.
Implementation Date: 1993

Economic Overview
Capital Cost: None
Maintenance/Recurring Costs:
Chloroform is $17.95 per liter
Dichloromethane is $22.95 per liter
$200 per year for the less hazardous/more expensive chemical
Barriers/Obstacles: None

### *CYTOSPIN OR THIN PREP TECHNOLOGY*

Substitute filter preparation on some fluids with cytospin or thin prep technology. This can eliminate the need to use chloroform to dissolve the filter.

### *ATOMIC ABSORPTION STANDARDS*

Produce atomic absorption (AA) standards only as needed. Atomic Absorption (AA) is used to determine copper and other trace metals in blood and other samples. Waste from heavy metal Atomic Absorption standards should be collected and disposed of as hazardous waste. Standards should be produced in small quantities and only as needed.

### *ANALYSIS OF CHLORIDE BY ION-SELECTIVE ELECTRODE (ISE)*

Analysis of chloride by ISE is preferable to the colorimetric method. Colorimetric analysis uses a mercury reagent, and generates a highly toxic waste stream for which collection and disposal may be difficult and expensive.

### *GLUCOSE TESTS WITHOUT ZINC*

Other types of glucose tests are available and should be utilized whenever possible to eliminate zinc as a waste stream.

### *BOUIN'S SOLUTION*

Bouin's solution, containing formaldehyde and picric acid, is used for washing bone marrow cells and as a preservative. An alternative using acetic acid is available.

### *CARRIER LIQUID*

The amount of chemicals in lab processes may be reduced and still get accurate results. Sometimes this can result in a reduction of chemicals used as shown in the following case study.

**Carrier Liquid Case Study**

Company Name: City of Hope National Medical Center - Duarte
SIC Code: 8062
Business Activity: Cancer Hospital and Medical Research
Waste Stream/CWC: Carrier liquid/CWC 541
Quantity of Waste (yr-gal): 1993 - 150 gallons a month
Process Generating the Waste: Purification and removal of oligonucleotides from synthesized DNA.
Estimated Source Reduction (%): 50%
Source Reduction Approach/Measure: Production Process Change
Brief Description of Measure: Modification of DNA purification process. Reduces the volume of chemical necessary to purify and remove oligonucleotides from synthesized DNA. This was accomplished by reducing by 50% the amount of carrier liquid ran through the purification columns. (50% reduction from the amount of carrier liquid called for in the standard Millipores/Waters protocol for this process.)
Implementation Date: March 1993

Economic Overview
Capital Cost: None
Maintenance/Recurring Costs: None
Return on Investment:
Savings: Raw material $100.00 per month
Transportation and disposal costs - $4200 per year
Total Savings: $5400.00 per year
Barriers/Obstacles: None

### *ZENKER'S SOLUTION AND MERCURY B-5*

Two common tissue fixatives, Zenker's solution and B5, are especially problematic because they contain high levels of mercury. These solutions are extremely hazardous and should be used only in the smallest possible volumes, with all wastes rinsed to hazardous waste containment - never to a sink. While Zenker's may be the solution of choice in a few instances, lab managers should discourage its use whenever possible. Expending the additional time and care necessary to obtain excellent specimens using other non-metallic fixatives will reduce disposal costs. Ten percent formalin may be an effective substitute as a fixative for bone marrow, kidney, and testicular biopsy specimens. Also, zinc fixatives are substitutes and can reduce or eliminate mercury chloride precipitates that require costly hazardous waste disposal. The pH in zinc-formalin mixtures has to be carefully controlled. Zinc fixatives provide good nuclear detail but not as good as mercury fixatives. Surgical specimens, biopsies, and skin lesions generally work well with zinc.

### *PRESERVING STOOL SAMPLES*

Formaldehyde / acetic acid / sodium acetate alternatives are available for concentrated copper solutions or mercury / poly vinyl alcohol (PVA) solutions used in preserving stool samples. There is also zinc and copper PVA. Specimens with mercury must be disposed of as hazardous waste. The Department is considering regulations in the future to allow specimens with zinc and copper to be disposed of as medical waste or poured down the sewer if it is allowed by your local POTW.

### *THIMERISOL*

Thimerisol, which contains mercury, is used as a preservative in some buffer solutions. Alternatives such as sodium azide are available for some applications in immunodiagnosis. Sodium azide should not be released down the drains. It slowly accumulates and reacts with the metal in cast iron pipes and forms an explosive material.

### GLUTARALDEHYDE

Activated glutaraldehyde solutions lose their toxicity when held for a period of time (usually 14 to 21 days). After that time they may be acceptable for discharge to your local POTW as long as all other laws and regulations are satisfied. First check with your local POTW to verify if this waste can be disposed of safely in your sanitary sewer. If it cannot be disposed of down the sewer, it would still be a less hazardous waste and would be manifested out as a less hazardous waste.

### FORMALDEHYDE/FORMALIN

Formaldehyde may be **reused** in autopsy and pathology laboratory specimen preservation. Direct reuse may be possible, since solutions retain desirable properties longer than specimen holding times. Effective preservation may be feasible at concentrations less than the 10 percent typically used.

Properly control **airborne emissions** from formaldehyde by keeping containers covered. Formaldehyde is a suspected carcinogen of the upper respiratory system. Personal solvent monitoring badges are available that record the amount of exposure to formalin, formaldehyde, and xylene. With a VOC badge, you can specify up to three chemicals to be recorded out of a choice of six. Glutaraldehyde monitoring badges are also available.

Using the **smallest sized container** of formaldehye fixative for all processes will reduce the amount of formaldehyde generation. Prefilled containers are available in many sizes and they can also be filled at the site. Staff should be informed to use the smallest suitable container. Use of prefilled containers is slightly more expensive than use of bulk formaldehyde. Disposal costs are minimized by using less solution to perform the analyses.

**Treatment** systems are available to detoxify formaldehyde. Some products available are Formalex, VYTAC 10F, and Scigen. (See Appendix C - Technology Transfer Advisories) check with your local POTW to verify if this waste can be disposed safely in your sanitary sewer. If it cannot be disposed of down the sewer, it would still be a less hazardous waste and would be manifested out as a less hazardous waste for less cost. The treatment of formaldehyde by a health care facility using a technology combination certified by DTSC pursuant to HSC Section 25200.1.5 (as authorized by CCR Section 67450.20) qualifies for a conditional exemption-specified wastestream (See Appendix D).

An **onsite solvent recovery system** for formaldehyde may be cost effective. Before considering any type of distillation unit, consider the following:

### DISTILLATION CHECKLIST

Feasibility Considerations

Determine if you can use the recycled product in your laboratory without compromising test quality and results.

If there is a wide range of boiling points (I.e., numerous solvents), distillation may yield a solvent that is different from the original, required blend. Mixing solvents may require the use of more expensive vacuum distillation units. Don't mix wastes, especially nitrocellulose-based materials with solvents.

Safety Considerations

Consider fire and ignition sources, ventilation needs, and spill containment issues before choosing location for the unit.

Contact the fire marshal, insurance company, electrical inspectors, and independent testing laboratories regarding equipment safety concerns before you purchase a unit.

Make sure the distillation unit has automatic shut-off controls for temperature malfunctioning. Also, make sure the unit has shut-off controls when all the solvent is reclaimed and a relief valve for pressure build-up.

Make sure controls are intrinsicially safe and there are features that will prevent the opening of a distillation unit until recycling and cooling is completed.

Determine how your unit will condense and/or recover solvent vapors.

Economic Considerations

Require equipment vendor to distill a sample of your waste so you can evaluate the quality and quantity of distilled product and still bottoms. Ask your vendor about the distillation unit's solvent recovery percentage and operational guarantees.

Require a performance guarantee for the installation and successful inspections by electrical inspectors and fire marshals.

Determine all costs of operating a distillation unit. Those costs include:

Labor Costs (loading waste, monitoring distillation process, unloading still bottoms, and cleaning machine)

Electricity / Energy Costs

Equipment / Maintenance Cost (e.g. fittings, gasket replacement)

Still Bottom Disposal Costs

Still Liner Costs (if applicable)

Condenser Water Costs (sewer or treatment charges)

Facility Upgrade Costs

There must be separate ventilation and a designated space for operation. There may be special utility issues to consider.

Training Costs

If operational support is not included in the equipment purchase, still operators will require training.

Regulatory Considerations

Be sure to consider regulatory requirements for recycling, still bottom storage and labeling, and hazardous waste generation category determination.

The following summarizes the purchase and use of a formalin recycling unit.

**Onsite Formalin Recycling Case Study**

Company Name: Kaiser Permanente Medical Center, Fresno - Pathology Lab
SIC Code: 8062
Business Activity: Provide healthcare to Kaiser Permanente members
Waste Stream/CWC: Laboratory waste - (non recoverable formalin sludge) CWC 214/135
Quantity of Waste (gal/yr): 20 gallon/year (estimate)
Process Generating the Waste: Processing of surgical specimens
Estimated Source Reduction (%): 90%
Source Reduction Approach/Measure: Recycling
Brief Description of Measure: Formalin is recycled onsite.
Implementation Date: 1995

Economic Overview
Capital Cost: $15,000
Maintenance/Recurring Costs: Repair costs (one time $2400), 20 gallons a year sludge to manifest
Return on Investment: $5737.20 saved (no purchase of formalin in 1996) 280 gallons per year recovered (1996)
Discharge Impacts to Air, Water, and Land: The recycler reduces the amount of formalin that is disposed of by approximately 90%.
Barriers/Obstacles: There is less than 10% volume that is unrecoverable sludge.
Comments: No longer need to purchase 10% formalin which currently costs $20.49 per gallon.

Substitutes for formalin are available. Laboratory staff need to test them thoroughly.

**Formalin Substitute for Tissue Fixation Case Study**

Company Name: Los Angeles County-King/Drew Medical Center
SIC Code: 8062/General Medical and Surgical Hospitals
Business Activity: Provides personal health services to the Los Angeles County population.
Waste Stream/CWC: Laboratory Waste - Formalin/CWC 214
Quantity of Waste (lbs/yr): 3260 lbs in 1994
Process Generating the Waste: Formalin solution (4% formaldehyde) is used in the histology laboratory for tissue fixation.
Estimated Source Reduction (lbs/%): If this had been successful, the expected reduction was estimated to be 2120 lbs or 65%.
Source Reduction Approach/Measure: Input Change
Brief Description of Measure: A commercially available non-toxic substitute for the formalin solution, Histo-Choice, was tested in the histology laboratory for tissue fixation.
Implementation Date: Measure rejected.
Barriers/Obstacles: The fixation period was very slow and time consuming.
Comments: It was concluded by the laboratory staff that it is infeasible to use Histo-Choice.

### *OTHER SOLVENTS*

Waste solvent solutions (alcohol and xylene) generated from slide preparation in cytology may be reused in a **"step down"** method. This may allow the solutions to be used for up to one month before being discarded. The first slides dipped into the initial solution leave contaminates in the alcohol or xylene. As a result each consecutive dipping solution thereafter is less contaminated. When the first dipping solution becomes too contaminated, it must be eliminated and replaced with the second dipping solution. The last solution is then replaced with fresh alcohol or xylene.

If a solvent must be used, consider using **nonchlorinated solvents** instead of chlorinated solvents.

Investigate the use of **simple alcohols and ketones** instead of petroleum hydrocarbons. Toluene and xylene are examples of compounds to replace. Terpene-based solvents and naphtha isoparaffinic hydrocarbons may be substituted for xylenes used for slide cleaning in some applications. Terpene-based solvents are less toxic and have a higher boiling point. Xylene has a low flashpoint and/or a low boiling point and should be kept in a cool place, away from open flame, sunlight, or artificial light, and with the lid tightly closed. Carefully evaluate citrus-based substitutes. Citrus-based alternatives may reduce worker exposure but may produce a hazardous waste because these products may have a flashpoint less than 140 degrees Farenheit. Cases of contact dermatitis and migraines from the odor have also been reported with exposure to these products. These citrus-based solvents may process samples slower than xylene and will require temperature and time modifications. Generally, these products are effective on samples in the micrometer range. However, thicker samples may be difficult or impossible to process. Vegetable-based substitutes are also available. Evaluate hazardous waste and quality issues before using xylene alternatives.

A **scintillation fluid** is used to amplify low energy signals generated when a low energy radioactive material decays. Low energy radioactive materials are used as "markers" in various types of research (including biomedical and pharmaceutical). Scintillation fluids contain various levels of xylene and toluene which are hazardous chemicals and need to be handled as such. Consider using a biodegradable scintillation fluid instead of a xylene/toluene based scintillation fluid. The waste from biodegradable products do not contain solvents.

Minimize **extraction sample sizes** to reduce the quantity of solvents used.

Use **calibrated equipment**, such as pipettes and graduated cylinders to dispense solvents. This equipment allows for minimal use of the solution.

Evaluate routine processes such as fixation and extraction to determine if quantities of **reagents** used in these processes can be minimized. Monoclonal antibodies, radioisotope-labeled immunoassays, and ultrasensitive analytical devices may reduce or eliminate the need for solvent extractions and fixation. Tests can be run to see if accuracy can be maintained with smaller volumes. Alternative methods may not require the use of reagents. Use calibrated dispensers to minimize waste resulting from overpouring. Unitized test kits include pre-measured quantities of reagents.

With Coplin jars and slide mailers that hold the slide vertically, solutions only need to be filled to the top of the specimen, not to the top of the jar. Select a container that **minimizes solutions used** and reduces the amount of stain that must be purchased and discarded. Extend bath life as long as possible. Often baths are discarded routinely by shift or after they have been used to process a certain number of slides. Money and waste can be saved by only discarding baths when they begin to show contamination or loss of effectiveness. **Filter and cover baths** between uses to significantly extend bath life.

Baths are used for fixing / rinsing of microscope slides with pathologic specimens. Consider using an **eye dropper** for one slide instead of immersing it in a bath that can hold five slides. Both waste and contaminated rinsate volumes can be reduced if slides are stained with a few drops of solution rather than a dipping bath. Sometimes the **bath size can be reduced** as shown in the following case study.

**Reduction of Slide Baths Case Study**

Company Name: City of Hope National Medical Center - Duarte
SIC Code: 8062
Business Activity: Cancer Hospital and Medical Research
Waste Stream/CWC: Hydrocarbon Solvents/CWC 213
Quantity of Waste (yr-gal): 1992 - 40 gallons per month
Process Generating the Waste: Baths are used for fixing and rinsing of microscope slides with pathologic specimens.
Estimated Source Reduction (%): 50%
Source Reduction Approach/Measure: Operational Improvement
Brief Description of Measure: Reduced the size of slide baths from 500 ml to 250 ml.
Implementation Date: 1992

Economic Overview
Capital Cost: None
Maintenance/Recurring Costs: None
Return on Investment: Savings on raw material - $253 month
Savings on waste disposal - $1440 per year
Total Savings: $4476 per year

Different processes may have different **purity requirements for fresh solvents** as shown in the following case study.

**Substitution of Low Grade Solvents with High Grade Solvents Case Study**

Company Name: City of Hope National Medical Center - Duarte
SIC Code: 8062
Business Activity: Cancer Hospital and Medical Research
Waste Stream/CWC: Acetonitrile/CWC 214
Quantity of Waste (yr): 1993
Process Generating the Waste: Chemical synthesis of nucleocides
Estimated Source Reduction (%): 20%
Source Reduction Approach/Measure: Input Change
Brief Description of Measure: Substitution of low grade solvents with high grade solvents. In the past, acetonitrile (ACN) was distilled from magnesium. About 20% of the raw material used in the process ended up as hazardous waste. By purchasing ACN instead of distilling it from magnesium, 20% waste byproduct is eliminated. The high cost of ACN, $79 per gallon, results in this not being a cost effective source reduction method. The decision to implement this measure was not based on source reduction, but rather it was based on eliminating a time consuming distillation process.
Implementation Date: 1993

Economic Overview
Capital Cost: Although the figures were never captured, the high cost of ACN does make this a negative figure from the single standpoint of source reduction In so far as any possible savings on person-hours and/or other related factors, that information was not calculated and/or captured.

Separate waste solvents into containers specific to single compounds so that simple **distillation** is more feasible. Otherwise, more expensive fractional distillation may be needed. Batch distillation column costs can vary greatly. Consider local ordinances, fire codes, unit reliability, and performance before installing. If solvent wastes cannot be segregated, combined quantities of waste solvents may be large enough to warrant distillation using a fractionating distillation column. An example would be separation of xylene from ethanol in histology wastes. If onsite recycling is not cost effective, consider offsite recycling or the use of a waste exchange. If distillation is not feasible, and offsite disposal is chosen, alcohol and xylene should be separated from other wastes. The fuel value decreases when water and oxygenated organic compounds (alcohols) are present. Fuel blenders charge less to dispose of wastes with high heating values. For information about waste exchanges, contact the California Waste Exchange at (916) 322-4742, Fax (916) 327-4495, or on the Internet at http://www.calepa.cahwnet.gov/dtscdocs/cawastex.txt.
To reach the California Materials Exchange dial (800) 553-2962.

The following is an example of the use of an onsite solvent distillation unit for xylene and reagent grade alcohol.

**Onsite Recycling of Xylene and Reagent Grade Alcohol Case Study**

Company Name: UC Davis Health System, Sacramento Medical Center
SIC Code: 8062
Business Activity: Full service clinical diagnostic laboratory
Waste Stream/CWC: Laboratory waste - Xylene/CWC 214 and Alcohol/CWC 214
Quantity of Waste (yr-lbs): Xylene January-December 1996 - 3328 lbs.
Alcohol October-December 1996 - 3744 lbs.
Process Generating the Waste: Xylene is used to remove the paraffin wax from the tissue specimens in histology. Xylene is also used in automatic tissue processing and staining machines. Alcohol may be used as a fixative for cells in cytology. Following fixation, alcohol solutions (in varying concentrations) are used to dehydrate (dewater) and decolorize tissue prior to staining.
Estimated Source Reduction (lbs/%): Xylene 3168 lbs/ 95%
Alcohol 160 lbs/ 4% (October-December 1996)
Source Reduction Approach/Measure: Recycling
Brief Description of Measure: Recycle xylene and reagent grade alcohol onsite in a solvent distillation unit.
Implementation Date: Xylene - January 1996
Reagent grade alcohol - October 1996

Economic Overview
Capital Cost: $18,100 ($17,800 for distillation unit, and $300 for electrical upgrades)
Maintenance/Recurring Costs
Labor costs Xylene:
System monitoring = 40 hours
Loading and cleaning = 240 hours
Dispensing and delivering = 48 hours
Total labor costs = 328 hours x $20 = $6560
Labor costs per gallon of reclaimed Xylene = $16.56
Labor costs Alcohol:
System monitoring = 5 hours
Loading and cleaning = 10 hours
Dispensing and delivering = 2 hours
Total labor costs = 17 hours x $20 = $340
Labor costs per gallon of reclaimed Alcohol = $17.00

Cost per gallon of virgin material and its waste disposal:
Xylene - approximately $10.63 ($8.04 + $2.59)
Alcohol - approximately $15.70 ($8.30 + $7.40)
(January - December 1996) Xylene
396 reclaimed gallons X $8.04/gallon = $3,183 in reclaimed savings
(October - December 1996) Alcohol
20 reclaimed gallons X $8.30/gallon - $166 in reclaimed savings

Waste Disposal Savings
Xylene(396 gallons X $2.59) + Alcohol(20 gallons X $7.40) = $1173.64

Overall Savings for January - December for Xylene and October - December for Alcohol
($3183.84 + $166 + $1173.16) - ($6900) = $2477 net loss

Return on Investment: No actual savings at this time due to the labor costs involved in operating the distillation unit at a remote site rather than at the point of generation. See Barriers/Obstacles below for further information and future strategies.
Discharge Impacts to Air, Water, and Land: Decrease in amount of waste being manifested out and reduction in purchase of new products.

Barriers/Obstacles: Due to space constraints and staffing issues, the distillation unit is operated in the hazardous materials facility. The fact that the building is not temperature controlled hinders production of recycled xylene and alcohol. Temperature extremes confuse the controller of the unit and make completion of a second run impossible. It is the intention to remedy this problem by relocating to a temperature controlled facility. The capacity of the distillation unit (2.5 gallons) limits the volume of waste that can be processed in a single shift. It would be more efficient to have the generators of the waste handle the day to day operations of distillation. In addition, technical assistance is available only by telephone which makes it difficult to solve problems in a timely manner.
Comments: Histology and cytology departments were able to use the reclaimed xylene routinely by February 1996. Still working out the obstacles to providing alcohol on a routine basis.

Several hospitals can **consolidate their wastes** so that sufficient waste quantities are available to make use of a **centralized recycling location**. Kaiser Permanente Medical group submitted the following abstract demonstrating their use of this concept.

**Centralized Recycling of Xylene, Xylene Substitutes, and Alcohol Case Study**

Company Name: Kaiser Permanente Medical Group, Regional Laboratory-Berkeley
SIC Code: 8062/General Medical and Surgical Hospitals
Business Activity: Full service clinical diagnostic laboratory
Waste Stream/CWC: Laboratory waste-Xylene/CWC 214a and Alcohol/CWC 2141c
Quantity of Waste (yr-lbs): January-April 1994, 22,727 lbs.
Process Generating the Waste: Xylene solutions are used to remove the paraffin (a wax like material used in the slide preparation process) from the tissue specimens in Histology. Xylene solutions are also used in automatic tissue processing and staining machines. Alcohol may be used as a fixative for cells in Cytology. Following fixation, alcohol solutions (including ethanol and methanol) are used to dehydrate (de-water) and decolorize tissue prior to staining.
Estimated Source Reduction (lbs/%): 10,256 lbs/50% for Alcohol and Xylene (Jan.-April 1994 only). Total waste from Jan-Dec. 94 was 24,234 lbs.
Source Reduction Approach/Measure: Recycling
Brief Description of Measure: Recycle xylene, xylene substitutes, and alcohol solutions onsite in a solvent still.
Implementation Date: January 1994-April 1994

Economic Overview
Capital Cost: $29,000 ($25,000 for distiller unit, and $4,000 for additional water removal unit)
Maintenance/Recurring Costs:
Labor costs: (January 1994 - April 1994)
System monitoring=33 hours
Loading and cleaning = 25 hours
Dispensing = 41 hours
Total labor costs = 99 hours X $20 = $1980
Labor cost per gallon of reclaimed solvent = $2.39
Cost per gallon of virgin material and its waste disposal:
Alcohol = approximately $26.11 ($10.80 + $15.31)
Xylene = approximately $25.31 ($10.00 + $15.31)

( Jan - April 1994)
Alcohol - 453 reclaimed gallons X $10.80/gallon = $4892 in reclaimed savings
Xylene - 377 reclaimed gallons X $10.00/gallon = $3770 in reclaimed savings
(453 gallons X $15.31) + (377 X $15.31) = $12,709 Avoided Waste Disposal
Alcohol Reclaimed Savings ($4892) + Xylene Reclaimed Savings ($3770) + Avoided Waste Disposal ($12,709) - Labor Costs ($1980) = $19,391 Net Savings

(Jul. - Dec. 1994)
Alcohol - 853 reclaimed gallons X $10.80/gallon = $9212 in reclaimed savings
Xylene - 746 reclaimed gallons X $10.00/gallon = $7460 in reclaimed savings
(853 gallons X $15.31) + (746 X $15.31) = $24,480 Avoided Waste Disposal
Alcohol Reclaimed Savings ($9212) + Xylene Reclaimed Savings ($7460) + Avoided Waste Disposal ($24,480) - Labor Costs (Approximately 139 hours at $20/hour ($2787) = $38,365 Net Savings

Return on Investment: Total savings in 1994 was $57,756.00

Discharge Impacts to Air, Water, and Land: Decrease in amount of waste being manifested out and reduction in purchase of new products.
Barriers/Obstacles: A 55 gallon solvent still had not been previously sold by the manufacturer to a hospital. It had only been used in commercial settings. The manufacturer was not able to provide technical assistance so the hospital had to develop processes through trial and error.
Comments: The Histology and Cytology departments were able to use the reclaimed solvents routinely by February 1994.

# NURSING, PATIENT CARE, PHARMACY, PHYSICIANS

### CHEMOTHERAPY AND ANTINEOPLASTIC WASTES

The greatest volume of antineoplastic wastes is generated from drug dispensing devices, contaminated protective clothing, and associated paraphernalia. Many of these items are regulated by the Medical Waste Management Program and should be handled accordingly. If you need clarification on these regulations, contact them at (916) 327-6904.

Provide **separate containers** with distinctive labels in chemotherapy drug handling areas. Chemotherapy receptables should be small to discourage general usage.

Purchase drugs in container sizes that permit **formulation of daily dosages** with a minimum of leftover contents. Also, obtain pre-scored ampule containers to minimize spillage associated with breaking open unscored ampule necks. If possible, consider preparing the medication only after the patient has arrived. This will eliminate unused material being discarded as hazardous waste if the patient is too ill to receive treatment or otherwise misses an appointment.

Emphasize proper handling practices to **minimize hood cleaning** requirements. The actual cleaning frequency required depends on drug handling volume and the amount of spillage which occurs in the hood. Waste generated from these cleaning procedures may also be biohazardous waste. (See Health and Safety Code Section 117635.)

### MERCURY CONTAINING EQUIPMENT

**Substituting solid state electronic sensing devices** for mercury-containing devices for monitoring termperatures and blood pressure is the primary minimization alternative for mercury wastes in hospitals. Digital thermometers, electronic sensors, and temperature strips are available alternatives to mercury thermometers. Also, mercury thermometers should not be sent home with patients. These and other items in patient care kits that are repeatedly not used in patient procedures and become unused waste should be negotiated with the purchasing alliance to exclude them from the kits. Blood pressure cuffs with electronic sensors are available and esophageal dilators, Cantor tubes, and Miller Abbot tubes can be found with tungsten weighting. If economic constraints pose a barrier, consider a multi-year plan for phase-out of mercury containing devices. Prioritize by first replacing mercury containing equipment in carpeted areas and mobile devices.

**Replace Mercury Sphygmomanometers with Aneroid Sphygmomanometers Case Study**

Company Name: Los Angeles County-King/Drew Medical Center
SIC Code: 8062/General Medical and Surgical Hospitals
Business Activity: Provides personal health services to the Los Angeles County population.
Waste Stream/CWC: Mercury Waste/CWC 725/181
Quantity of Waste (yr-lbs): 1994-200 lbs
Process Generating the Waste: Employees used or serviced mercury sphygmomanometers daily and a number of mercury spills had resulted from breakages.
Estimated Source Reduction (lbs/%): 150 lbs/75%
Source Reduction Approach/Measure: Input Change
Brief Description of Measure: Replace mercury sphygmomanometers with aneroid sphygmomanometers in the patient care areas.
Implementation Date: The mercury sphygomanometers were replaced with TycosR Aneroid Sphygmomanometers in fiscal year 1993-94.
Discharge Impacts to Air, Water, and Land: Aneriod sphygmomanometers do not contain mercury so there is no longer any hazardous waste.
Comments: The accuracy of the aneroid sphygmomanometers is acceptable and it is technically feasible to replace the mercury sphygmomanometers.

**Non-mercury Thermometers, and Electronic/Chemical Piezometric Devices Case Study**

Company Name: Childrens Hospital Los Angeles
SIC Code: 8060/Acute Care Hospital (Pediatric)
Business Activity: Licensed Acute Care Pediatric Hospital with School of Physical Therapy, Medical Technology, and X-Ray Technology (USC Affliation).
Waste Stream/CWC: Mercury Waste/121, 725, & 551
Quantity of Waste (yr-lbs): 1995 - 21 lbs.

Process Generating the Waste: Thermometers, blood pressure cuffs, and related instruments/devices.
Source Reduction Approach/Measure: Input change
Brief Description of Measure: Replace with non-mercury thermometers, and electronic/chemical piezometric devices.
Implementation Date: 1990 to present.

Economic Overview
Capital Cost: Replacement of old mercury units to new electronic devices were spread over a long period to ensure new devices and product manufacturers gave a product that could be used in our pediatric setting. The cost was not capital related but instead was a matter of finding the appropriate devices for the hospital's use.
Maintenance/Recurring Costs: Chemical thermometers are inexpensive but add to solid waste measurements. Electronic devices for blood pressure and thermometer reading are comparable in cost to mercury containing instruments because they do not have the high disposal costs. In addition, the electronic devices do not pose a hazard to patients and workers.
Discharge Impacts to Air, Water, and Land: Reduction of mercury spills, vapor releases, and recycling problems. Increase in solid waste (trash) from chemical thermometers, i.e., single use device.
Barriers/Obstacles: Training for use of new devices.

**Mercury** can be recovered for **reuse** and contaminated mercury turned over to a commercial mercury recycler. To get a copy of the "California Waste Exchange" listing mercury recyclers, contact the:

Department of Toxic Substances Control
Hazardous Waste Management Program
P.O. Box 806
Sacramento, CA 95812-0806
(916) 322-4742, FAX (916) 327-4495
For online access contact
http://www.calepa.cahwnet.gov/dtscdocs/cawastex.txt

Specially designed mercury vacuums and **spill absorbent kits** can be purchased and should be available in all areas where mercury-containing equipment such as thermometers and blood pressure cuffs are used.
Proper training is also needed to protect employees from inhalation, skin absorption, and ingestion hazards. Ensure that nitrile gloves, not latex gloves, are available for use during cleanup.

The **Anderson Tube** has titanium and can be an acceptable substitute for Canter Tubes.

**Zinc air batteries** are now available to replace the mercury batteries used in telemetry units.

### *WASTE ANESTHETIC GASES*

Nonhazardous substitutes are not available for anesthetic gases. Waste minimization methods focus on reducing leaks. Generally, equipment less than 10 years old complies with **low leakage standards**.

**Inspections and maintenance** of anesthesia equipment, scavenging equipment, and ventilation systems should be performed regularly and by qualified personnel. Proper routine maintenance is essential. Quarterly monitoring of waste anesthetic levels in operating rooms, recovery rooms, dental suites, and adjacent rooms that may receive waste gases should be performed.

Before inducing anesthesia, employ the following **low-leakage anesthetic practices**: confirm proper connections and leak tightness of equipment; and avoid spillage of liquid anesthetics while filling vaporizers. During anesthesia administration, anesthetists can reduce leakage by properly fitting the mask on the patient's face before turning on anesthetic flow, and by turning off the gas supply before disconnecting the breathing circuit during short interruptions.

### *HEMODIALYSIS - FORMALDEHYDE*

Formalin is formaldehyde in a water and methanol solution. It is used for cleaning dialysis machines.

Consider installing **reverse osmosis (RO)** water supply equipment. The use of RO units allows a reduction in the cleaning frequency requirements of dialysis machines.

Perform culture studies to determine the **minimum strength of formalin** required and the minimum cleaning frequency for adequate disinfecting of dialysis machines and water supply systems. Waste generation rates are proportional to cleaning frequency and formalin strength.

A solution of **peracetic acid, acetic acid, and hydrogen perioxide** can be substituted for formaldehyde-based disinfectants. Equipment that can be heat-disinfected may be available in the near future.

Dispensing **formalin via a central distribution system** with plumbing connected to each machine minimizes waste that may result from spillage.

### *PRESCRIPTIONS*

Evaluate drug ingredients for metals and prescribe **non-metallic alternatives** when feasible. Selenium, an extremely toxic heavy metal, is found in some dandruff shampoos. Wastewater treatment does not remove enough selenium. Zinc ointments prescribed for diaper rash and other dermatology applications enter the sewer when babies are bathed or when the diapers are washed.

In addition to making monitoring patient drug use more difficult, **open formularies** may significantly contribute to the volume of drugs that must be disposed. Open formularies allow providers to dispense samples to patients. This dispensing practice encourages the development of secondary storage areas. Once established, secondary storage areas and their environments cannot be controlled. When drugs are improperly stored (e.g. improper cooling requirements) they may become obsolete and require disposal which will increase disposal costs. The distribution of drugs samples should be tracked and reduced.

Implement policies that **discourage drug representatives** from leaving excessive amounts of sample medications. Medical providers (who may have offsite offices) with hospital privileges accumulate samples that may become a disposal problem for pharmacies. Typically, pharmacies dispose of these drugs gratuitously for the provider.

## RADIATION THERAPY

### RADIOACTIVE WASTE

Radioactive wastes are generated from nuclear medicine and from clinical testing laboratory departments. Source reduction and substitution are the primary waste minimization methods for radioactive wastes.

Try to use suppliers that will accept the **return of Isotope containers**.

Evaluate processes for **substitution of long-lived isotopes with short-lived isotopes**. For example, use iridium-192 or cesium-137 in place of radium-226.

Provide one hundred to 200 square meters for **isolation and interim storage** of short-lived radioactive wastes during decay to acceptable levels.

Ensure radioactive wastes are kept **segregated, centrally processed, and properly labelled** as to form, isotope, date of calibration, and chemical composition. Proper labeling and handling are legally required and make waste management decisions easier. Radioactive and other hazardous wastes should not be mixed. Mixed waste must be disposed so that all regulations pertaining to chemical waste and radiological wastes are met. This greatly increases disposal costs.

## RADIOLOGY

Hospital radiology departments typically generate wastewater containing silver from spent processing solutions and other photographic chemicals. The photographic developing solutions used in X-ray departments consist of two parts, a fixer and a developer. The fixer normally contains ammonium thiosulfate, 1-5 percent potassium hydroxide, and less than 1 percent silver. The developer contains approximately 45 percent glutaraldehyde and 5 to 10 percent hydroquinone. Acetic acid is a component of stop baths and fixer solutions. There is chromium in developer cleaners and selenium in toners. Other wastes include spoiled chemicals and scrap film.

Be sure the **storage** area has proper temperature and light conditions for photoprocessing chemicals. Meeting recommended storage conditions will increase the shelf life of chemicals.

**Test material** with expired shelf life for effectiveness before being returned or disposed. The expired material may still be usable.

Try to use **suppliers** that will accept unused materials.

Consider **consolidating** X-ray processor use to reduce the number of machines that are needed. This reduces maintenance and equipment costs and makes a centralized treatment system more practical.

A **silver recovery** unit recovers silver salts in photoprocessing wastewater. Silver is a component in most photographic films and paper and is present in the wastewaters produced. It can be precipitated from fixing baths and purchased by a commercial recycler. Various economical methods of recovering silver are available such as metallic replacement, chemical precipitation, and electrolytic recovery. Metallic replacement is the most common technology. The spent fixing bath is pumped into a cartridge containing steel wool. An oxidation-reduction reaction occurs and the iron in the wool replaces the silver in solution. The silver settles to the bottom of the cartridge as a sludge. Check the cartridges frequently and replace them as required, using the freshest cartridge last in the series. The remaining aqueous waste, containing approximately 1.4 percent glutraraldehyde, 0.3 percent hydroquinone, and 0.2 percent potassium hydroxide, is typically discharged to the sewer. Recovered silver is worth about 80% of its commodity price. Companies that buy silver can be located under “Gold and Silver Refiners and Dealers” in a business telephone directory. These firms may pick up directly or may purchase through dealers.

You may want to install your own silver recovery unit. Commercial recovery units are available if the level of activity is great enough to

justify buying or leasing one. Be sure to consider any permitting requirements that may apply. The recovery of silver from photofinishing qualifies as a conditional exemption-specified waste stream. The volume limit for conditional exemption is 500 gallons per generator (at the same location) in any calendar month. Silver recovery from photofinishing is completely exempt from authorization requirements if the quantity treated is 10 gallons or less in any calendar month. You do not need to notify DTSC if you qualify for this exemption. Retain documentation verifying your eligibility for this exemption, such as developer invoices. (See Appendix D). There are also packaged distillation and precipitation units available. A distillation unit can reduce the amount of hazardous waste requiring manifesting by as much as ninety percent. The aqueous waste can be discharged to the sewer and the hazardous waste is much smaller in volume.

**Spent fixer** may be stored as hazardous waste and hauled away by a licensed transporter. Several hospitals can also consolidate their wastes so that sufficient waste quantities are available to make use of a centralized treatment location. Centralization reduces the amount of sampling required and the number of systems to be maintained. This offsets the increase in collection and transportation time as shown in the following case study.

**Recycling of Spent Photographic Fixer Solution Case Study**

Company Name: Kaiser Foundation Hospitals - Biomedical Engineering Facility - Berkeley
SIC Code: 8062
Business Activity: Maintenance and asset management of Kaiser Foundation Hospitals' equipment
Waste Stream/CWC: Spent photographic fixer solution/CWC 541
Quantity of Waste (yr-lbs): 1997 - 1,092,000 lbs.

Process Generating the Waste: X-ray processing produces a wastewater of spent photographic fixer solution.
Estimated Source Reduction: Not applicable
Source Reduction Approach/Measure: Recycling
Brief Description of Measure: The Kaiser Biomedical Engineering Facility picks up used film and delivers the X-ray chemicals to 38 Kaiser hospitals and clinics in Northern California. The used film is picked up by a photowaste recycler at the biomedical facility. Once the fixer distillation unit was installed, we also began to collect the spent fixer from each facility for silver recovery.
Implementation Date: 1992
Economic Overview
Capital Cost: $80,000 for distiller unit, $45,000 for three silver recovery units, and $10,000 for tanks and miscellaneous. Regulatory fees of $80,000. Total capital cost of $215,000.
Maintenance/Recurring Costs: The pick-up and hauling was done by the same Kaiser employee who already delivered the solutions. Labor cost is included should additional employees be hired, although we did not need to increase our staff.
System monitoring = 100 hours
Loading and cleaning = 800 hours
Dispensing = 60 hours
Total Labor Cost = 960 hours x $18.01 = $17,290
50,000 ounces of silver x average rate per ounce of silver ($5.50) = $275,000
$275,000 - labor cost ($17,290) = $257,710 per year
Return on investment after 10 months is $257,710 per year.
Discharge Impacts to Air, Water, and Land: Silver bromide crystals, when discharged into the drain, have a negative impact on the micro organisms which are used at the waste treatment plant to dissolve fecal materials.
Barriers/Obstacles: Going through the standardized permitting process.
Number of Measures Rejected: None
Comments: If this process was not in place, it would cost Kaiser approximately $320,000 to have the silver bromide hauled off and Kaiser Foundation would not receive the proceeds from the silver.

**Limits for silver** are frequently established by the POTW. Waste water is hazardous if its concentration of silver is greater than 5 ppm. Elemental silver can be acutely toxic to aquatic life. Free silver ions are considered to be bactericides, creating conditions which disrupt biological systems. There may also be limits on biochemical oxygen demand, pH, or other constituents. A permit is required from your local POTW to flush fixer or other photochemical waste down the drain. Very few POTWs waive this local requirement. In addition, the effluent may have to be neutralized within a ph range of 5.0 to 9.0 prior to discharge.

**Used and spoiled film** can be sold to a recycler. This may be practical if operations are large enough and recyclers are located close enough to the hospital and will pick up your film. Although a recycler may not be listed in your city, one from a nearby area may pick up your film. For example, recyclers from the Bay area do pick up in Sacramento County. To recycle used film, remove the film from the jacket to receive a better rate of payment. The recycler will also take unprocessed film since it too contains silver. Film is not a hazardous waste. Once the silver is removed, the remaining X-ray film is a recyclable polyester.

New technology exists that allows for **in-process recycling** of up to 50% of both the **developer and fixer**. An in-line silver recovery unit can also be attached. This recycling is accomplished while still preserving the chemical balance necessary for the proper development and archival quality of the film. Some hospitals have also found they can extend the life of the developer for double emulsion film. The developer is pumped out of the processer holding tank and put through a 5 micron filter into a container. The solution is poured back into a tank and more developer is added. A test strip is done and if it is acceptable, the developer is reused. When bromide levels get too high in the developer, the film does not develop correctly.

**Cleaners without chromium** for your X-ray processor system are now available. Chromium, referred to as an anti-oxidizer, is a hazardous waste and must be collected for proper disposal. The solution can not be combined with other photo processing waste. With careful preventative maintenance, it may also be possible to eliminate the need for use of any chemical.

**Digital imaging and PACS**, picture archival and communications systems, or **dry process film equipment** use no liquid chemicals. Both of these new technologies are available. With their use there is no costly chemical disposal or need for silver recovery. Efficiency and cost savings may be found in the handling,transfer, and storage of records electronically.

## *RESOURCE RECOVERY*

Resource recovery involves both material reuse and recycling. Material reuse, a form of source reduction, occurs when the waste from one process is directly used as raw material for the same or another process. Recycling involves the purification, separation, or concentration of valuable material from a waste stream before the waste is disposed of. The material is then used by the originating process, or by another process at the same site. Recycling may take place either onsite or elsewhere through an offsite service.

### *WASTE SEGREGATION*

Waste segregation consists of placing different wastes into different containers. While neither a source reduction nor a recycling practice itself, waste segregation is critical to the success of any program designed to reduce or recycle waste materials. When only a single container is provided for all waste materials, it is common for nonhazardous wastes to be placed in the same container with hazardous wastes. This increases the amount of hazardous waste being generated, and places additional burdens on already overtaxed offsite treatment and disposal facilities. By providing separate, prominently labeled containers for each waste type, less nonhazardous waste will be placed in hazardous waste containers. Many companies have noticed a decrease in the total amount of hazardous waste being sent offsite after implementing waste segregation. Segregating wastes also increases their recyclability. Education to

support the rationale and procedures for waste segregation is essential for its implementation.

### RECYCLERS

Other materials may also be recycled such as 55-gallon drums, plastic containers, wooden pallets, and toner cartridges. Presently, the prices paid are very low, but the recycling of waste to protect our environment is of sufficient motivation to ensure continued success in this area. The California Materials Exchange (CALMAX), operated by the California Integrated Waste Management Board, is dedicated to the reuse and recycling of excess products, materials, and waste by business and industry. To obtain a "Materials Listing Catalog" of wanted or available materials or a listing of recycling centers located near you, call the California Integrated Waste Management Board at 1-800-553-2962. The Department of Toxic Substances Control also publishes an annual listing of commercial hazardous waste recyclers, including facilities outside of California, titled the "California Waste Exchange Directory". You may get a copy of the Directory by contacting the Department of Toxic Substances Control, Hazardous Waste Management Program, P.O. Box 806, Sacramento, CA, 95812-0806, (916) 422-4742, FAX (916) 327-4495, or for online access http://www.calepa.cahwnet.gov/dtscdocs/cawastex.txt

## TREATMENT AND PRETREATMENT

The ultimate goal of waste minimization programs is to reduce the amount of hazardous waste that is sent offsite for disposal. If the waste can not be reduced, reused, or recycled, it may be treated.

Treatment refers to processes that destroy wastes and yield waste streams that pose little or no environmental risk. Pretreatment is applied to waste streams to make them more suitable for recycling or final treatment in a POTW. Many of the same processes can be used for treatment and pretreatment, and the terms are often used interchangeably.

### PRETREATMENT

Consider the feasibility of installing a pretreatment unit for formaldehyde and other organic solvent wastes. Formaldehyde and solvent discharges to sewers may be prohibited or limited by regulations.

### VOLUME REDUCTION

An evaporation unit can remove excess water from waste. A small quantity of concentrated waste will generally cost less to treat than a large volume of diluted waste, whether performed onsite or by a reclaimer. Although the absolute quantity of metal recovered from both may be the same, the net value recovered is greater from the concentrated waste. As long as the cost of concentrating the waste stream does not exceed the difference, it is an economic advantage to reduce the quantity of waste through some type of concentration process. Check with your local air quality board prior to installing an evaporation unit.

## HAZARDOUS WASTE STORAGE AND HANDLING

You may generate additional hazardous waste if you store raw materials or hazardous wastes improperly. Store them in covered containers. **Covered containers** will help reduce spills and evaporation, contamination of product from dust, and corrosion of the drum top from rain. A locked, covered, indoor area with a concrete floor and curbs for spill containment would be ideal for storage. A **curb or dike** surrounding the storage pad will prevent spills from leaving the storage area. A slightly sloped storage pad will help accumulate the spill in a smaller area so it will be easier to clean up. Chemical cabinets and secondary containment pallets for outdoor use can be purchased with covers or tarps. Inspect the storage area often, at least once a week, to look for leaky containers or improper storage. A good time to **inspect** your storage area(s) is during your raw materials inventory. Be sure to document the date and time of inspections.

Waste minimization requires waste **segregation**. Mixed wastes cost more to manage. Be sure to segregate infectious from hazardous waste. All empty bags, packages, and containers that contained hazardous materials should be fully segregated from those that contained nonhaz-

ardous materials. Keep different solvent wastes due to equipment cleanup segregated. If you mix different kinds of wastes, you reduce recycling potential, and if the chemicals are incompatible, a violent reaction can occur, i.e., strong acids and bases together. Keep aqueous wastes associated with equipment cleanup segregated from the solvent wastes. Keep spent alkaline solutions segregated from the rinsewater streams.

A **vapor recovery system** for storage tanks can help reduce evaporative losses. Routine monitoring of all above and below ground storage tanks is essential to prevent major losses through leaks, and is required by law.

**Document** individual wastes with their sources of origin and eventual disposal, along with incurred disposal costs. Computerized waste documentation and control can help track the wastes in the process and can help in undertaking control strategies.

Store appropriate wastes in **secondary containment**. The manual iron-cyanide test yields a concentrated cyanide solution that should be collected, stored in secondary containment segregated from all acidic solutions, and disposed of as hazardous waste.

### *STORAGE LIMITATIONS*

If you generate less than 1000 kilograms of hazardous waste per month and the quantity accumulated onsite never exceeds 6000 kilograms at any one time, you may store up to 6000 kilograms of hazardous waste or one kilogram of extremely hazardous waste onsite for up to 180 days before shipping offsite. If it is to be shipped further than 200 miles away, then you have up to 270 days to ship it offsite.

If you generate greater quantities of hazardous waste than explained above, you may store whatever quantity of hazardous waste or one kilogram of extremely hazardous waste for up to 90 days.

Either of the generators above can use satellite accumulation, where you may store up to 55 gallons of hazardous waste or one quart of extremely hazardous waste for each waste stream at or near the generation location for up to a year.

Storage of hazardous waste for longer than these specified times, requires an appropriate permit or variance. Title 22, California Code of Regulations (CCR), Section 66262.34 specifies the allowable storage times for hazardous waste. Contact your local Department regional duty officer for information on applying for a permit. Contact your local environmental health office for more information on local requirements.

### *LAB PACKS*

Wastes from laboratories, nursing units, clinics, and storage areas are often placed in “lab packs” for disposal.

Lab packs are drums containing small bottles, vials, cans, and other containers of waste.

When preparing lab packs, wastes are segregated so that the lab pack contents are compatible.

Lab packs contain absorbent cushioning to prevent breakage and to absorb leakage of liquid contents.

Lab packs are shipped offsite to a Class 1 landfill or to a waste treatment or incineration facility.

## Table 1: How do you store your raw materials and hazardous wastes?

**Check the boxes that apply to your storage area(s).**

| Storage | Hazardous Waste | Raw Materials | Comments |
|---|---|---|---|
| Indoors | | | Some fire departments recommend storing flammable wastes outdoors to reduce fire danger, but remember to follow the other storage hints. |
| Outdoors | | | |
| Covered | | | A covered storage area is important because rain water can increase your waste volumes or contaminate raw materials. Also, exposure to sunlight can change the characteristics of raw materials or dangerously raise the pressure inside sealed containers. You should keep individual containers covered to prevent evaporation and spills. Uncovered storage requires extensive permitting and is not recommended. |
| Uncovered | | | |
| Diked Concrete Pad | | | A diked concrete pad will contain spills better than asphalt or dirt.<br>Storage of materials on dirt surfaces should always be avoided. In addition to potential ground contamination, moisture collecting under drums can lead to corrosion and failure of the drum. For facilities with limited space, combination pallet / containment systems are available. |
| Dirt Surface | | | |
| Asphalt Surface | | | |
| Locked | | | Without secure storage facilities, some unscrupulous hazardous waste generators may deposit their wastes in your containers, increasing your disposal costs. |
| Unlocked | | | |

# SECTION 2: EVALUATION OF WASTE MINIMIZATION OPTIONS

After reading Section I, note your Waste Minimization Options in Table 2. Then use the following scores to evaluate your options further. Each option will be rated and given a point score in four areas:

1) Where does the option fit in the Waste Minimization Hierarchy?
   1 to 5 points
2) What is the option's Implementation Potential?
   0 - 4 points
3) What is the Type of Option?
   1 - 4 points
4) How much does the Option Cost?
   1 - 4 points

Add up the point scores for each option. In Section 3 you will examine more closely those specific waste reduction options that score the highest. And, you can drop from further consideration any options that have no implementation potential.

### 1) Waste Minimization Hierarchy

The waste minimization hierarchy (WMH) consists of the following, which are listed in the preferred order.

| | | |
|---|---|---|
| SR = | Source Reduction | = 5 points |
| RR = | Resource Recovery | = 4 points |
| RI = | Recycling (in-process) | = 4 points |
| RE = | Recycling (end-of-pipe) | = 3 points |
| TI = | Treatment (in-process) | = 2 points |
| TE = | Treatment (end-of-pipe) | = 1 point |

### 2) Implementation Potential

The implementation potential (IP) is the chance that you believe an option has of being used in your hospital:

| | |
|---|---|
| High | = 4 points |
| Medium | = 3 points |
| Low | = 2 points |
| None | = 0 points |

For options that you evaluate as "none" or having no potential of being implemented into your hospital, no further evaluation is necessary. However, keep track of such options because you may wish to reconsider them at a later date if circumstances at your hospital have changed.

### 3) Type of Option

"Type of Option"" refers to what the option consists of, and what level of effort is required to put it to use. Four classes or types of options were developed. You may feel that a further breakdown is necessary, or may want to establish your own classes. Feel free to make changes since only you know about your individual hospital practices. The four classes are:

| | | |
|---|---|---|
| P/P = | Policy or Procedural Change | = 4 points |
| PM = | Process Modification | = 3 points |
| EM = | Equipment Modification | = 2 points |
| NE = | New Equipment | = 1 point |

### 4) Cost of Option

"Cost of Option" refers to a rough idea of what you believe it will cost to implement each waste reduction option. Specific cost details will be estimated later in Section 3.

| | |
|---|---|
| None or no cost | = 4 points |
| Low cost | = 3 points |
| Medium cost | = 2 points |
| High cost | = 1 point |

### Total Point Score

Evaluate each option in the four areas, add up their scores, and complete the table. Review the table to identify the options with the highest scores. A score of 17 is possible.

This is a preliminary analysis of the options to quickly identify those which are desirable for implementating into your hospital. A more detailed study into the costs of each option should be conducted in Section 3 to see exactly how the option will affect your hospital financially and the option's payback period.

The above classes and point values for each area are not hard and fast rules, only guidelines. If you feel you have more than four ways to evaluate options, develop your own classes and their respective point values.

Remember, the primary purpose of this part of the Guide is to stimulate your thinking about which waste minization options make the most sense within your hospital.

## Table 2 Waste Minimization Option Evaluation

**Example: Waste Minimization Option Evaluation**

Example: Evaluate the following two options to determine the Waste Minimization option that would be the most attractive.

1) Start a First-in First-out Material usage policy.
2) Install equipment to recycle formalin onsite.

| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
|---|---|---|---|---|---|---|---|
| 1) First-in First-out Material usage policy | No | $0 | SR(5) | H(4) | P/P(4) | N(4) | 17 |
| 2) Recycle formalin onsite | No | $15,000 | RE(3) | H(4) | NE(1) | M(2) | 9 |

After totaling the scores, you can see that implementing a first-in first-out policy should be implemented before recycling formalin onsite. The next step is further evaluation of the economic feasibility and associated payback period using Table 3: Evaluation of Costs and Savings.

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Management Practices | | | | | | | |
| * Established waste minimization program | | | N/A | | | | |
| * Material balances performed | | | N/A | | | | |
| * Employee education | | | N/A | | | | |
| * Regulatory compliance | | | N/A | | | | |
| * Locate departments generating hazardous waste | | | N/A | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Material Safety Data sheets (MSDSs) | | | | | | | |
| * MSDS available for all hazardous materials | | | N/A | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Materials Inventory and Storage | | | | | | | |
| * Install computerized inventory storage | | | SR (5) | | | | |
| * When appropriate, use "JIT" or "Just in Time" ordering | | | SR (5) | | | | |
| * Inspect raw materials to ensure are not damaged | | | SR (5) | | | | |
| * "First-in, first-out" usage of all materials | | | SR (5) | | | | |
| * Label and date materials when received | | | SR (5) | | | | |
| * Periodic inspections of materials | | | SR (5) | | | | |
| * Store materials in reusable containers | | | SR (5) | | | | |
| * Store hazardous materials away from nonhazardous | | | SR (5) | | | | |
| * Segregate different types of materials/chemicals | | | SR (5) | | | | |
| * Reduce storage area traffic | | | SR (5) | | | | |
| * Use a dust recovery system | | | SR (5) | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Materials Inventory and Storage (continued) | | | | | | | |
| * Limit raw materials access | | | SR (5) | | | | |
| * Minimize stock on hand | | | SR (5) | | | | |
| * Return obsolete raw material to supplier | | | SR (5) | | | | |
| * Use supplies only for their intended purpose | | | SR (5) | | | | |
| * Stack containers safely | | | SR (5) | | | | |
| * Store materials as directed by manufacturer | | | SR (5) | | | | |
| * Provide secondary containment as appropriate | | | SR (5) | | | | |
| * Use flexible packing materials for formaldehyde specimens | | | SR (5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Drums and Containers | | | | | | | |
| * Store drums on pallets | | | SR (5) | | | | |
| * Return empty drums to suppliers | | | SR (5) | | | | |
| * Provide adequate space between drums | | | SR (5) | | | | |
| * Dispose of drums properly | | | SR (5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Spill Control | | | | | | | |
| * Lift drums by powered equipment or hand trucks | | | SR (5) | | | | |
| * Conduct proper spill cleanup | | | SR (5) | | | | |
| * Install spill containment | | | SR (5) | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
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| Spill Control (continued) | | | | | | | |
| * Conduct practice drills for major spills | | | SR (5) | | | | |
| * Inspect tanks for corrosion or stress | | | SR (5) | | | | |
| * Use spigots, pumps, piping, or funnels for dispensing or transferring waste materials | | | SR (5) | | | | |
| * Keep storage areas clear and surfaces even | | | SR (5) | | | | |
| * Store chemicals properly | | | SR (5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Hazardous Waste Minimization | | | | | | | |
| Facilities | | | | | | | |
| * Proper inventory control for aerosols | | | SR (5) | | | | |
| * Recycle aerosol cans | | | RE(3) | | | | |
| * Recharge batteries | | | SR (5) | | | | |
| * Recycle batteries | | | RE(3) | | | | |
| * Replace mercuric oxide batteries with zinc air batteries | | | SR (5) | | | | |
| * Install flooring and counter tops resistant to chemicals | | | SR (5) | | | | |
| * Replace halon fire extinguishers | | | SR (5) | | | | |
| * Control corrosion in hot water systems | | | SR (5) | | | | |
| * Eliminate floor waxes or wax strippers containing zinc | | | SR (5) | | | | |
| * Eliminate cleaning products containing tributyl tin | | | SR (5) | | | | |
| * Use phenolic compounds only in critical areas | | | SR (5) | | | | |
| * | | | | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Facilities (continued) | | | | | | | |
| * Separate thermometers and rags used to clean up hazardous spills out before doing laundry | | | SR (5) | | | | |
| * Manage laundry chemicals through worker training, prepackaged laundry chemicals, and/or an automated laundry chemical feed system. | | | SR (5) | | | | |
| * Install tunner washers | | | SR (5) | | | | |
| * Recycle fluorescent tubes | | | RE(3) | | | | |
| * Replace mercury lights | | | SR (5) | | | | |
| * Recharge laser jet cartridges | | | SR (5) | | | | |
| * Replace oil-based paints with water-based paints | | | SR (5) | | | | |
| * Purchase paint only in needed quantities | | | SR (5) | | | | |
| * Use a paint gun washer and recycler | | | RR(4) | | | | |
| * Control overspray when using a paint gun | | | SR (5) | | | | |
| * Use petroleum distillates or other alternative cleaning methods for parts washing | | | SR (5) | | | | |
| * Properly locate/maintain solvent parts washer stations | | | SR (5) | | | | |
| * Use non-chemical pest control methods | | | SR (5) | | | | |
| * Use less toxic pesticides | | | SR (5) | | | | |
| * Do not spill contents of sewer lines, traps, or sumps | | | SR (5) | | | | |
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| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Laboratories | | | | | | | |
| * Share chemicals between laboratories | | | SR (5) | | | | |
| * Replace alcohol-based disinfectants with sonic or steam cleaning | | | SR (5) | | | | |
| * Use subsitutes for chromic acid and sulfuric acid for glassware cleaning | | | SR (5) | | | | |
| * Use biodegradable detergents and/or aqueous reagents as a cleaning substitute | | | SR (5) | | | | |
| * Use countercurrent cleaning with solvents | | | SR (5) | | | | |
| * Switch to one type of solvent | | | SR (5) | | | | |
| * Train staff in proper "pre-wash" procedures for autoclave labware washers | | | SR (5) | | | | |
| * Substitute tungsten for mercury in analyzing GI tubes | | | SR(5) | | | | |
| * Substitute mercury thermometers in lab ovens and water baths with alcohol (red) and digital thermometers | | | SR(5) | | | | |
| * Use cell sorting and counting instruments that do not use cyanide | | | SR (5) | | | | |
| * Install automated systems or other instrumentation for lab chemistry analyses | | | SR (5) | | | | |
| * Install an automatic slide stainer | | | SR (5) | | | | |
| * Use microanalytical techniques | | | SR (5) | | | | |
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| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Laboratories (continued) | | | | | | | |
| * Substitute carbon dioxide for ethyl ether as a laboratory euthanizing agent | | | SR(5) | | | | |
| * Substitute chloroform with dichloromethane in lab phase extractions | | | SR(5) | | | | |
| * Substitute filter preparation with cytospin or thin prep technology | | | SR(5) | | | | |
| *Produce atomic absorption (AA) standards only as needed | | | SR(5) | | | | |
| * Perform analysis of chloride by ion-selective electrode | | | SR (5) | | | | |
| * Utilize glucose tests without zinc | | | SR (5) | | | | |
| * Use alternatives to Bouins solution | | | SR (5) | | | | |
| * Reduce chemicals used in lab processes | | | SR(5) | | | | |
| * Minimize use of Zanker's solution and Mercury B-5 | | | SR (5) | | | | |
| * Preserve stool samples with alternatives to mercury poly vinyl alcohol | | | SR (5) | | | | |
| * Investigate alternatives to Thimerisol | | | SR(5) | | | | |
| * Properly dispose of glutaraldehyde | | | TE(1) | | | | |
| * Reuse formaldehyde in autopsy and pathology lab | | | RR(4) | | | | |
| * Control airborne emissions from formaldehyde | | | SR(5) | | | | |
| * Use appropriately sized (the smallest) formaldehyde containers for processes | | | SR(5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Laboratories (continued) | | | | | | | |
| * Treat waste formaldehyde | | | TE(1) | | | | |
| * Recycle formaldehyde | | | RE(3) | | | | |
| * Utilize formalin substitutes | | | SR(5) | | | | |
| * Reuse waste solvent solutions in a "step down" method | | | RI(4) | | | | |
| * Replace chlorinated solvents with nonchlorinated solvents | | | SR(5) | | | | |
| * Replace petroleum hydrocarbons with simple alcohols and ketones | | | SR(5) | | | | |
| * Use a biodegradable scintillation fluid instead of a xylene/toluene based scintillation fluid | | | SR(5) | | | | |
| * Minimize extraction sample sizes | | | SR (5) | | | | |
| * Use calibrated equipment to dispense solvents | | | SR(5) | | | | |
| * Reduce quantities of reagents used in routine processes | | | SR(5) | | | | |
| * Select containers that minimize solutions used | | | SR(5) | | | | |
| * Filter and cover baths between uses to extend bath life | | | SR(5) | | | | |
| * Stain slides with drops instead of a dipping bath | | | SR(5) | | | | |
| * Reduce bath sizes for fixing/rinsing of microscope slides | | | SR (5) | | | | |
| * Experiment with purity requirements for solvents | | | SR(5) | | | | |
| * Recycle solvents onsite | | | RE(3) | | | | |
| * Recycle solvents offsite | | | RE(3) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Nursing, Patient Care, Pharmacy, Physicians | | | | | | | |
| * Segregate chemotherapy wastes from other wastes | | | SR(5) | | | | |
| * Purchase chemotherapy drugs in container sizes that permit formulation of daily dosages with a minimum of leftover contents | | | SR(5) | | | | |
| * Minimize hood cleaning | | | SR(5) | | | | |
| * Substitute electronic sensing devices for mercury-containing devices | | | SR(5) | | | | |
| * Recycle mercury | | | RE(3) | | | | |
| * Have mercury spill cleanup kits available | | | SR(5) | | | | |
| * Substitute Anderson Tubes for Canter Tubes | | | SR(5) | | | | |
| * Substitute zinc air batteries for mercury batteries in telemetry units | | | SR(5) | | | | |
| * Use low-leakage anesthetic equipment | | | SR(5) | | | | |
| * Regular inspections and maintenance of anesthesia equipment, scavenging equipment, and ventilation systems | | | SR(5) | | | | |
| * Employ low-leakage anesthetic practices | | | SR(5) | | | | |
| * Install reverse osmosis (RO) water supply equipment for dialysis machines | | | SR(5) | | | | |
| * Determine minimum strength of formalin and minimum cleaning frequency of dialysis machines | | | SR(5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Nursing, Patient Care, Pharmacy, Physicians (cont.) | | | | | | | |
| * Investigate substituting a solution of peracetic acid, acetic acid, and hydrogen peroxide for formaldehyde in cleaning of dialysis machines | | | SR(5) | | | | |
| * Dispense formalin for dialysis machines via a central distribution system | | | SR(5) | | | | |
| * Prescribe non-metallic shampoos and medications | | | SR(5) | | | | |
| * Consider closed formularies | | | SR(5) | | | | |
| * Monitor outside drug sources | | | SR(5) | | | | |
| Radiation Therapy | | | | | | | |
| * Return isotope containers to the distributor | | | RE(3) | | | | |
| * Evaluate processes for substitution of long-lived isotopes with short-lived isotopes | | | SR(5) | | | | |
| * Provide space for isolation and interim storage of short-lived radioactive wastes during decay to acceptable levels | | | SR(5) | | | | |
| * Keep radioactive wastes segregated, centrally processed, and properly labelled as to form, isotope, date of calibration, and chemical composition | | | SR(5) | | | | |
| * | | | | | | | |
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| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Radiology | | | | | | | |
| * Proper temperature and light conditions for storage of photoprocessing chemicals | | | SR(5) | | | | |
| * Test material with expired shelf life for effectiveness | | | SR(5) | | | | |
| * Return obsolete or off-spec chemicals to manufacturer | | | RE(3) | | | | |
| * Consolidate X-ray processor use | | | SR(5) | | | | |
| * Recover silver salts in photoprocessing wastewater | | | RE(3) | | | | |
| * Test photoprocessing wastewater before discharge | | | TE(1) | | | | |
| * Sell used and spoiled film to a recycler | | | RE(3) | | | | |
| * Recycle developer and fixer | | | RE(3) | | | | |
| * Substitute cleaners for X-ray processor that do not contain chromium | | | SR(5) | | | | |
| * Perform careful preventative maintenance on X-ray processor to eliminate the need for the use of any chemical | | | SR(5) | | | | |
| * Install digital imaging and PACS (picture archival and communication systems) or dry process film equipment | | | SR(5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Resource Recovery | | | | | | | |
| * Segregate wastes | | | SR(5) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| * | | | | | | | |

| Table 2 Waste Minimization Option Evaluation | | | | | | | |
|---|---|---|---|---|---|---|---|
| Waste Minimization Technique | Done Yet? Yes/No or NA | Cost Dollar Amount to Implement | WMH Score SR=5 RR/RI=4 RE=3 TI=2 TE=1 | IP Score High=4 Med=3 Low=2 Non=0 | Option Type Change Procedure=4 Change Process=3 Change Equipment=2 New Equipment=1 | Option Cost None=4 Low=3 Med=2 High=1 | Total Score |
| Treatment and Pretreatment | | | | | | | |
| * Install a pretreatment unit for formaldehyde and other organic solvent wastes | | | TE(1) | | | | |
| * Install an evaporation unit to remove excess water from waste | | | TE(1) | | | | |
| * | | | | | | | |
| * | | | | | | | |
| Hazardous Waste Storage and Handling | | | | | | | |
| * Inspect containers for leaks and proper storage | | | SR(5) | | | | |
| * Store different waste types in separate containers | | | SR(5) | | | | |
| * Comply with storage time limitations | | | SR(5) | | | | |
| * Cover storage containers | | | SR(5) | | | | |
| * Install containments such as curbs or dikes | | | SR(5) | | | | |
| * Tie storage tanks into a vapor recovery system | | | SR(5) | | | | |
| * Monitor storage tanks for leaks | | | SR(5) | | | | |
| * Document individual wastes with sources of origin and disposal costs | | | SR(5) | | | | |
| * Segregate containers that contained hazardous materials from those that contained nonhazardous materials | | | SR(5) | | | | |
| * Segregate different solvent wastes | | | SR(5) | | | | |
| * Segregate aqueous wastes from solvent wastes | | | SR(5) | | | | |
| * Segregate spent alkaline solutions from rinsewater | | | SR(5) | | | | |
| * Store appropriate wastes such as concentrated cyanide solutions in secondary containment | | | SR(5) | | | | |

# SECTION 3: EVALUATION OF COSTS AND SAVINGS

Use the worksheet in this section to make rough estimates of required investments, annual savings, and payback periods for each waste reduction option that you wish to evaluate. Compare both the investment amounts and payback periods for the options when deciding which ones make the most sense for your hospital. Photocopy the form if you need extras.

This worksheet does not take into account amortization, depreciation, the cost of money, or tax factors. You may wish to consider these elements for options where the capital expenditure is significant, or outside financing is required.

## TABLE 3: Evaluation of Costs and Savings

**Waste Reduction Technique:** _____

**Capital Investment:**

| | |
|---|---|
| Equipment Costs | _____ |
| Freight and Handling | _____ |
| Installation | _____ |
| Shop Modification & Utilities | _____ |
| Construction Materials | _____ |
| Other | _____ |
| **Installation Costs:** | _____ |
| Training Cost | _____ |
| Initial Spare Parts | _____ |
| Value of Lost Production Time | _____ |
| **Other Costs:** | _____ |
| **Total Capital Investment:** | _____ |

| **Annual Cost Savings:** **Material or Service** | **Present System ($/Year)** | **New System ($/Year)** | **Estimated* Savings ($/Year)** |
|---|---|---|---|
| Utilities | | | |
| Chemicals | | | |
| Operation/Maint. Labor | | | |
| Repair Supplies | | | |
| Waste Handling | | | |
| Fees/Penalties | | | |
| Misc. | | | |
| Total Annual Amounts | | | |

(*Use negative numbers to indicate costs that will increase.)

$$\text{Payback period} = \frac{\text{Capital Investment}}{\text{Total Annual Savings}} = \_\_\_\_\_ \text{ Years}$$

# *APPENDIX A*
# *SELF-AUDIT GUIDE*

# *HAZARDOUS WASTE INVENTORY FOR WASTE MINIMIZATION ASSESSMENT*

## *HAZARDOUS CHEMICAL INVENTORY*

Complete separate forms for each location where hazardous chemicals are used or stored.

Process step or location: _____

Person completing inventory: _____

Telephone number: _____ Date: _____

| Chemical[1] | Quantity used per year[2] | Maximum quantity stored[2] | Hazard[3] | Comments |
|---|---|---|---|---|
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[1] Indicate whether gas, liquid, or solid.
[2] Indicate pounds, gallons, or cubic feet.
[3] Indicate toxic, corrosive, ignitable, or reactive.

## *HAZARDOUS WASTE GENERATION INVENTORY*

Complete separate forms for each process step or location where hazardous waste is generated.

Process step or location: _____

Person completing inventory: _____

Telephone number: _____ Date: _____

| Hazardous waste[1] | Quantity generated per year[2] | Fate[3] | Waste Code[4] | Hazard[5] | Comments |
|---|---|---|---|---|---|
| | | | | | |
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[1] Indicate source and whether gas, liquid, sludge, or solid.
[2] Indicate whether pounds, gallons, or cubic feet.
[3] Indicate whether onsite or offsite reuse, recycle, or treatment; sewer; or disposal.
[4] California Hazardous Waste Code Number and USEPA Hazardous Waste Identification Number, as available, from the Uniform Hazardous Waste Manifest or other waste tracking documents.
[5] Indicate whether toxic, corrosive, ignitable, or reactive.

## *HAZARDOUS WASTE INTERNAL MANIFEST*

Complete separate forms for each location where hazardous waste is accumulated.

Location: _____

Person completing inventory: _____

Telephone number: _____ Date: _____

| Date generated | Chemical | Quantity[1] | Phase[2] | Hazard[3] | Comments[4] |
|---|---|---|---|---|---|
| | | | | | |
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[1] Indicate whether pounds, gallons, or cubic feet.
[2] Indicate whether gas, liquid, sludge, or solid.
[3] Indicate whether toxic, corrosive, ignitable, or reactive.
[4] Contact your waste coordinator when manifest is complete or wastes need to be picked up.

# APPENDIX B

# ADDITIONAL SB-14 REQUIREMENTS

If you are completing this Self-Audit Guide for purposes of the State's Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14), you must also include Generator Information, Evaluation of Source Reduction Measures, Implementation Timetable, Numerical Goal, and Certification. For your convenience, an example of each has been taken from the Hazardous Waste Source Reduction Compliance Checklist (Document No. 004, September 1997), to assist you in meeting the requirements under SB 14 of 1989. These examples are provided immediately following this page.

## *GENERATOR INFORMATION*

Company Name:

Location Address: Mailing Address:

Generator USEPA ID Number: _____ SIC Code: _____

Contact Person: _____ Telephone: _____

Total quantity of hazardous waste generated in the reporting year, tons [1]: _____

California Hazardous Waste Code Numbers or USEPA Hazardous Waste Identification Numbers [2]:

_____

_____

_____

_____

_____

_____

Waste Description:

[1] Reporting year is the calendar year immediately preceding the year in which your Hazardous Waste Source Reduction Review and Plan is to be prepared.

[2] Alternatively, these code numbers can be listed in Appendix A, page A-3, Hazardous Waste Generation Inventory.

## EVALUATION OF SOURCE REDUCTION MEASURES

As part of completing the Hazardous Waste Source Reduction Review and Plan (Plan), you had identified potential source reduction opportunities. If you are completing this Self-Audit Guide for the purposes of meeting the requirements of the Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14), you must include an evaluation of your source reduction options and select those you wish to implement. The listings provided below can guide you in determining whether you have met the requirements of SB 14 in your evaluation.

Source reduction is defined in the law as any action which causes a net reduction of the generation of hazardous waste, or any action taken before the hazardous waste is generated that results in the lessening of the properties which cause it to be classified as a hazardous waste. Specific source reduction measures may be grouped under five source reduction approaches:

- input change
- operational improvement
- production process change
- product reformulation
- administrative steps

However, source reduction measures are none of the following:

- any action taken after a hazardous waste is generated
- any action that concentrates the constituents of a hazardous waste to reduce its volume or that dilutes the hazardous waste to reduce its hazardous characteristics
- any action that shifts hazardous wastes from one environmental medium to another environmental medium
- treatment

There are a variety of factors for evaluating potential source reduction measures, including:

- expected change in the amount of hazardous waste generated
- technical feasibility
- economic feasibility
- effect on product quality
- employee health and safety considerations
- requirements for permits, variances, and compliance schedules of applicable agencies
- releases and discharges to all media

You are not limited to the factors listed above. You may develop additional factors that you feel are important in developing a successful source reduction program at your site. Examples of additional factors you may consider include:

- reduction in the hazardous characteristic of the waste
- previous success of the measure within your organization
- previous success of the measure in other industries
- length of implementation period
- ease of implementation

You can also use the additional information provided in the Checklist and Assessment Manual or Waste Audit Study Report specific to your industry, to assist you in evaluating your source reduction options. Or, you can develop your own categories and criteria if you feel you have better ways to evaluate your options.

## *IMPLEMENTATION TIMETABLE*

| Source reduction measures you have chosen to implement at your site | The dates when you plan to begin implementing each measure and the date when the measure will be operational |
|---|---|
| | |

## NUMERICAL GOAL

Every generator who is subject to SB 14 must prepare a four-year numerical source reduction goal. The goal is included in a generator's Checklist and Assessment Manual, Waste Audit Study Report, or full Plan, as applicable.

The goal is not simply a reflection of your intended source reduction under SB 14, rather it is your estimate of the source reduction that your site could optimally strive to achieve over the next four years. The goal, a single numerical percentage, would reflect your organization's source reduction vision and commitment. The goal must reflect your company's waste stream reductions due only to source reduction and would exclude effects due to production variation or economic influences.

For example, Source Reduction Goal(%) =

$$\frac{\text{Total hazardous waste generation reduced by optimizing source reduction practices}}{\text{Total hazardous waste generation if source reduction measures were not considered at your site}} \times 100\%$$

The four-year numerical source goal for this site is:

_____% for the years _____ to _____ (your four-year planning period).

## CERTIFICATION

There are two certifications required by regulations - a technical certification and a financial certification. (Section 67100.10 Title 22 California Code of Regulations.)

TECHNICAL CERTIFICATION: If the Checklist and Assessment Manual or the Waste Audit Study Report is used to meet the requirements of SB 14, the completed document must be reviewed and certified by any one of the following persons for technical completeness. Check the appropriate box and provide the information below:

- ☐ an engineer who is registered as a professional engineer pursuant to section 6762 of the Business and Professions Code
- ☐ an environmental assessor who is registered pursuant to section 25570 of the Health and Safety Code
- ☐ an individual who is responsible for the processes and operations of the site

Please print the name of the person certifying this document:

Name: _____

Title: _____

Signature: _____ Date: ___/___/___

FINANCIAL CERTIFICATION: The Checklist and Assessment Manual or Waste Audit Study Report must be reviewed and certified that the reviewer is made aware of the document contents and resource commitment. Financial certification shall be made by any one of the following persons able to commit company finances. Check the appropriate box and provide the information below:

- ☐ the owner
- ☐ the operator
- ☐ the responsible corporate officer of the site
- ☐ an authorized individual capable of committing financial resources necessary to implement selected source reduction measures.

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or the persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for making false statements or representations to the Department, including the possibility of fines for criminal violations.

Please print the name of the person certifying this document:

Name: _____

Title: _____

Signature: _____ Date: ___/___/___

# APPENDIX C

# TECHNOLOGY TRANSFER ADVISORIES

DEPARTMENT OF TOXIC SUBSTANCES CONTROL
Environmental Technology Certification Program
400 P Street, Fourth Floor
P.O. Box 806—HQ-25
Sacramento, CA 95812-0806

# CERTIFIED ENVIRONMENTAL TECHNOLOGY
## TECHNOLOGY TRANSFER ADVISORY

# VYTAC 10F

***Issued To:***
Trend Scientific, Inc.
P.O. Box 120266
St. Paul, Minnesota 55122

***Contact:***
Steve Dolezal
(612) 633-0925

Bruce Chadderdon
4803 Lago Vista Circle
San Jose, CA 95129
(800) 984-4940

***Distributor:***

Baxter Healthcare Corp.
1450 Waukegan Road
McGaw Park, IL 60085

***Contact:***
Customer Service
(800) 964-5227

***Certification No:***
94-01-008

***Effective Date:***
January 2, 1995

***Expiration Date:***
January 2, 2000

***DTSC Contact:***
Dr. Bruce LaBelle
(916) 324-2958

***Technology Description:*** This technology is a simple, batch treatment process for 10 percent Fomalin generated by medical, educational, and laboratory facilities. It chemically treats formaldehyde waste waters in a provided 8 liter or other closed vessel with VYTAC 10F in specific ratio to waste and renders it non-hazardous. After being tested with an aldehyde test kit, the solution with inert polymer residues may then be disposed of by discharge to the sanitary sewer.

A copy of the published Certification Statement may be obtained by contacting the Department of Toxic Substances Control at (916) 322-3670 or from the Cal/EPA ACCESS computer bulletin board at (916) 322-5041.

Revision August 2, 1996

**CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY DEPARTMENT OF TOXIC SUBSTANCES CONTROL**

**Final Decision to Certify Hazardous Waste Environmental Technologies**

The California Environmental Protection Agency, Department of Toxic Substances Control (Department) has made a final decision to certify the following company's hazardous waste environmental technology listed below:

- Trend Scientific, Inc., P.O. Box 120266, St. Paul, MN 55122: VYTAC 10F, for treating 10 percent Formalin generated by medical, dental, and other health care facilities.

Chapter 412, Section 25200.1.5., Health and Safety Code, enacted by Assembly Bill 2060 (AB 2060), Weggeland, 1993, authorizes the Department to certify hazardous waste environmental technologies.

The purpose of the certification program is to provide an in-depth, independent review of technologies at the manufacturers' level to facilitate regulatory and end-user acceptance and to promote and foster growth of California's environmental technology industry.

The Department makes no express or implied warranties as to the performance of the manufacturer's product or equipment. The end-user is solely responsible for complying with the applicable federal, state, and local regulatory requirements. Certification does not limit the Department's authority to require additional measures for protection of public health and the environment.

By accepting certification, the manufacturer assumes, for the duration of certification, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal to or better than was provided to obtain certification and agrees to be subject to quality monitoring by the Department as required by the statute under which certification is granted.

The Department's proposed decision to certify has been previously noticed on October 14, 1994 in the California Regulatory Notice Register 94, Volume No. 41-Z. Written comments in relation to the proposed certification received during the public review and comment period have been duly considered in the final certification as presented here. The Department's final certification shall be effective on Monday, January 2, 1995.

Additional information supporting the Department's final certification decisions is available for review at:

California Environmental Protection Agency, Department of Toxic Substances Control, Office of Pollution Prevention and Technology Development, P.O. Box 806, 301 Capitol Mall, 1st Floor Sacramento, CA 95812-0806, Attn: Mr. Lindsee Tanimoto (916) 322-7287

A description of the technology to be certified, the final certification statement and the certification limitations for the technologies of each of the companies listed above follows.

CERTIFICATION PROGRAM (AB 2060) FOR HAZARDOUS -WASTE ENVIRONMENTAL TECHNOLOGIES
TECHNOLOGY CERTIFICATION

VYTAC 10F
TREND SCIENTIFIC, INC.

MANUFACTURER:
Trend Scientific, Inc., P.O. Box 120266,
St. Paul, MN 55122
Contact: Mr. Steven M. Dolezal (612) 633-0925

Technology Description:

The VYTAC 10F technology chemically treats formaldehyde wastewaters in a batch processing system, which is a closed vessel, manual treatment unit. The spent aldehyde solutions are transferred to the collection vessel with VYTAC 10F and are treated and rendered non-hazardous. After being tested with an aldehyde test kit, the solution with inert polymer residues may then be disposed of as a non-hazardous waste by discharge to the sanitary sewer. The evaluated reagent for aldehyde waste treatment

was VYTAC 10F. The apparatus utilized with VYTAC 10F is contained in S/P Brand VYTAC Daily Disposal System Starter Kit which includes:

—one 3.5 L Neutralizer

—one 8 L Reservoir with cover

—one measuring cup

—one stirring rod

—master of "Waste Treatment Log"

—instruction sheet

The VYTAC NF Test Kit is available for the semi-quantitative determination of formalin concentration in treated waste formaldehyde aqueous solutions. TREND offers Standards of 500, 300, 200, and 100 ppm that may be utilized in the test.

Certification Statement:

VYTAC 10F is hereby certified, pursuant to California Health and Safety Code Section 25200.1.5, by the California Department of Toxic Substances Control (Department) as a Hazardous Waste Treatment Technology when operated, monitored, and maintained according to manufacturer's standards and specifications. The certified technology has been determined to treat incremental amounts of 10% Formalin (aqueous solution containing approximately 3.75% formaldehyde by weight). The use of the VYTAC 10F process as directed has the potential to significantly reduce the exposure to aldehyde vapors, as well as the need for expensive waste hauling, and allows safe disposal of these treated wastes. Based on the certification process, the Department concludes that the VYTAC 10F process appears effective in reducing the concentration of formaldehyde in 10% formalin to 0.25 ppm. Some Publicly-Owned Treatment Works may require a pH adjustment prior to disposal down the drain. If required, the pH may be adjusted by adding an acid neutralizer like VYTAC ACX or one of the following: sodium hydroxide solution or sodium carbonate crystals.

Certification Disclaimer:

The Department believes that the manufacturer's product and/or equipment, when used in accordance with the manufacturer's specifications, can achieve the performance level set out in this Certification. Said belief is based on a review of the data submitted by the proponent, results of onsite verification tests, and results of the verification tests performed in the Department's laboratory. The Department makes no express or implied warranties as to the performance of the manufacturer's product and/or equipment. Nor does the Department warrant that the manufacturer's product or equipment is free from any defects in workmanship or material caused by negligence, misuse, accident or other causes. This does not constitute an endorsement of the specific product, nor does it intend to expand existing rights or obligations, waive legal defenses, or otherwise affect the legal position of the applicant companies.

Basis for Certification:

The Department reviewed data submitted by the proponent, which included copies of letters from hospitals, satisfied customers, state and local agencies, and test results from certified laboratories. The proponent first conducted demonstration tests in the presence of the Department's representatives at a State Laboratory and then, further independent confirmation/verification tests were performed by the Depart ment's Hazardous Materials Laboratory. Based on the evaluation of provided data and the results of these tests, the Department concluded that the VYTAC 10F process reduces the quantities and hazards of 10% Formalin to a fraction of the original amount, suitable for disposal to sanitary sewer.

Regulatory Considerations:

The Department intends to pursue regulatory certification for this technology after the adoption of regulations for such action. In the interim, the Department is addressing treatment of specific aldehyde wastes through Compliance Directive (EO-94-005 MM), "Treatment of Formaldehyde and Glutaraldehyde Sterilizing Solutions at Health Care Facilities."

Users of any 10% Formalin treatment system may still be subject to all local discharge limits,

including pH adjustment.

Staff of the State Water Resources Control Board, Pretreatment Program, have participated in the certification evaluation, support its findings, and have determined that the use of this formaldehyde treatment technology presents no burden to normal sewerage and wastewater treatment facilities.

Protection of Human Health and the Environment:

Formalin poses acute threats to the respiratory and digestive systems and is a probable human carcinogen. The use of VYTAC 10F, as an integral part of safe management practices, can provide valuable risk control and environmental protection. Existing practices in dealing with 10% Formalin waste include:

1. Uncontrolled or illegal disposal;
2. Hazardous waste hauling, followed by offsite treatment and disposal;
3. Burning the waste as a fuel supplement;
4. Other treatment technologies.

These practices may not reduce occupational exposures, nor provide equivalent protection to human health and the environment. Additionally, some practices may subject responsible parties to State or local agency enforcement actions.

Conclusions and Future Actions:

1. Duration of Certification:
   This Certification will remain in effect for the period of three years from its publication in the California Regulatory Notice Register, unless it is revoked for cause.
2. Continuous Quality Control / Quality Assurance:
   By accepting this Certification, the applicant companies accept, for the duration of this certification, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal or better than was provided to obtain this Certification.
3. Monitoring and Self-reporting Actions:
   The applicant companies have instituted appropriate internal quality control management systems and procedures, including a generator's waste treatment log. This log is considered by the Department suitable record for monitoring of the treatment and the generator's record of performance. The Department may review and evaluate this record of performance and compare it to the standards and specifications provided to obtain this Certification.
4. Procedure for Modifications and Amendments:
   Modifications and amendments of this certification may be requested by the applicant companies, and will be processed according to the provisions of the statute under which this certification is granted.
5. Status as "Pilot Certification":
   This Certification is issued as part of the pilot project for the California Environmental Technology Certification Program. The pilot project's purpose is to delineate the practical aspects of the program that will be adopted in regulations which are under development. Consequently, this Certification may be subject to additional conditions which will be required in these regulations, including, but not limited to, the duration of the certification, continuing monitoring and oversight requirements, and certification amendment procedures, including decertification.

# *CERTIFIED ENVIRONMENTAL TECHNOLOGY*
## *TECHNOLOGY TRANSFER ADVISORY*

## Formalex[R] FRC-3[TM]

***Issued To:***
American Bio-Safety, Inc.
4320 Anthony Court, No. 16
Rocklin, CA 95677

***Contact:***
Larry Larson
(916) 652-8021

S&S Company of Georgia
827 Pine Avenue
P.O. Box 45
Albany, Georgia 31702-0045

***Contact:***
Randy Skalla
(912) 435-8394

***Certification No:***
94-01-003

***Effective Date:***
August 8, 1994

***Expiration Date:***
August 8, 1999

***DTSC Contact:***
Bruce LaBelle
(916) 324-2958

### *Technology Description:*

This is a simple, batch treatment system for 10 percent Formalin and up to 4 percent glutaraldehyde which detoxifies aqueous wastes in a provided 2.5 gallon or other closed vessel utilizing Formalex[R] in specific ratio to the waste volume. The treatment chemically alters the wastes to allow for safe disposal to sanitary sewers. The FRC-3[TM] kit also provides methods of testing for unreacted aldehydes in the resultant solution which may contain up to ten percent by weight of polymeric colloidal solids which are non-hazardous.

A copy of the published Certification Statement may be obtained by contacting the Department of Toxic Substances Control at (916) 322-3670 or from the Cal/EPA ACCESS computer bulletin board at (916) 322-5041.

Revision May 20, 1997

immunoassay to monitor progress. Confirmatory laboratory testing would occur before a decision on site closure is made.

*Regulatory Implications*

The Department's Certification is based on the technology's performance and by itself does not change the regulatory status of PCB testing; it should, however, facilitate and encourage the acceptance of this technology where a project's data quality objectives can be met by its use. To this end, the Department's findings should contribute to a consideration of this technology in regulated activities, depending on each regulated program's objectives and constraints.

State certification does not imply certification by the U.S. Government for use at federal superfund sites and other facilities under the jurisdiction of the U.S. Government for which state authorization for administrative oversight has not been granted. Under state implementation of the U.S. Resource Conservation and Recovery Act (RCRA), Treatment, Storage, and Disposal Facilities may contact state permitting agencies for use of the immunoassay for operational monitoring as part of a Waste Analysis Plan (WAP).

This Certification is issued as part of a pilot project to expedite the California Environmental Technology Certification Program. As a result, this Certification is subject to the conditions set out in the regulations to-be-developed, such as the duration of the Certification, the continued monitoring and oversight requirements, and the procedures for certification amendments, including decertification.

By accepting this Certification, the manufacturer assumes, for the duration of the Certification, responsibility for maintaining the quality of the manufactured materials and equipment at a level equal or better than was provided to obtain this Certification and agrees to be subject to quality monitoring by the Department as required by the law under which this Certification is granted.

## CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### Final Decision to Certify Hazardous Waste Environmental Technologies

The California Environmental Protection Agency, Department of Toxic Substances Control (Department) has made a final decision to certify the following companies' hazardous waste environmental technologies listed below:

- Ensys, Inc., P.O. Box 14063, Research Triangle Park, NC 27709: PCB Risc™ Soil Test Kit, an enzyme immunoassay for fast, semi-quantitative field measurements of polychlorinated biphenyls in soil;
- American Bio-Safety, Inc., 4320 Anthony Court, Number 16, Rocklin, CA 95677 and S&S Company of Georgia, Inc.: Formalex® and FRC-3™ system for treating 10 percent Formalin and 4 percent glutaraldehyde wastes generated by medical, dental, and other health care facilities.

A new law effective January 1, 1994 (Chapter 412, Statutes of 1993, Section 25200.1.5., Health and Safety Code, enacted by Assembly Bill 2060, Weggeland), authorizes the Department to certify the performance of hazardous waste environmental technologies. Only technologies that are determined to not pose a significant potential hazard to the public health and safety or to the environment when used under specified operating conditions and which can be operated without specialized training and with minimal maintenance may be certified. Incineration technologies are explicitly excluded from the certification program.

The purpose of the certification program is to provide an in-depth, independent review of technologies at the manufacturers' level to facilitate regulatory and end-user acceptance and to promote and foster growth of California's environmental technology industry.

The Department makes no express or implied warranties as to the performance of the manufacturer's product or equipment. The end-user is solely responsible for complying with the applicable federal, state, and local regulatory requirements. Certification does not limit the Department's authority to require additional measures for protection of public health and the environment.

By accepting certification, the manufacturer assumes, for the duration of certification, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal to or better than was provided to obtain certification and agrees to be subject to quality monitoring by the Department as required by the statute under which certification is granted.

The Department's proposed decision to certify has been previously noticed on April 29, 1994 in the California Regulatory Notice Register 94, Volume No. 17-Z. Written comments in relation to the proposed certification have been received during the public review and comment period and have been duly considered in the final certification as presented here. The Department's final certification shall be effective on Monday, August 8, 1994.

Additional information supporting the Department's final certification decisions is available for review at:

California Environmental Protection Agency
Department of Toxic Substances Control
Office of Pollution Prevention and Technology Development
P.O. Box 806
301 Capitol Mall, 1st Floor
Sacramento, California 95812-0806
Attn: Mr. Terry Escarda (916) 322-7287

A description of the technology to be certified, the final certification statement and the certification limitations for the technologies of each of the companies listed above follows.

## Final Certification Notice

## CERTIFICATION PROGRAM (AB2060) FOR HAZARDOUS WASTE ENVIRONMENTAL TECHNOLOGIES

## TECHNOLOGY CERTIFICATION

### PCB Risc™ Soil Test System (Monoclonal Test)

**EnSys, Inc., P.O. Box 14063, Research Triangle Park, N.C. 27709**
**(In California: Dwight Denham, Tel. 714/644-8650)**

*Technology Description*

The technology is an enzyme immunoassay for fast, semi-quantitative field measurements of polychlorinated biphenyls (PCBs, as Aroclors) in soil. The reaction is performed on a methanol extract of a small sample of the soil. The EnSys system offers one or more semi-quantitative detection levels which can be customized for each project. The minimum detection level is 1 ppm for Aroclor 1248 with lower minimum detection levels of 0.4 ppm for Aroclors 1254 and 1260. The lowest detection level for a particular situation can be set at or above the minimum detection level. The second (and third, if needed) detection level can be set at higher levels by a factor of four or more, while maintaining the claimed accuracy and precision up to a maximum detection level of 500 ppm in soil. The manufacturer provides testing reagents and utensils, including a sample weighing balance and a photometer for field use, a user manual, material safety data sheets, field data recording forms, and instruction in the use of the testing system.

*Certification Statement*

Under the authority of Section 25200.1.5 of the California Health and Safety Code, the Department hereby certifies the PCB Risc™ Soil Test kit manufactured by EnSys, Inc. as a **Measurement Technology.** The test kit consists of a semi-quantitative immunoassay system for the detection of PCBs, as Aroclor mixtures. Provided that the immunoassay is used properly, the minimum detection level of Aroclor 1248 is 1 ppm levels, with lower minimum detection levels of 0.4 ppm for Aroclors 1254 and 1260. For the other Aroclors, higher target levels apply. The technology is applicable to testing of soil or soil-like material which is not highly contaminated with oil or other non-aqueous phase liquids (NAPLs). The efficiency of the test depends on the extraction of PCBs from the test soil into a methanol solution. The efficiency of extraction is reduced in excessively moist soils and may be affected by high clay or organic content of the soil. It is recognized that the calibration is biased so as to minimize the possibility of false negative results; other limitations are set forth below. The Department's findings are described in greater detail in an evaluation report.

*Limitations of Certification*

The Department makes no express or implied warranties as to the performance of the manufacturer's product or equipment. The Department has not conducted any bench or field tests to confirm the manufacturer's performance data. Nor does the Department warrant that the manufacturer's product or equipment is free from any defects in workmanship or material caused by negligence, misuse, accident, or other causes.

The Department believes, however, that the manufacturer's product or equipment can achieve performance levels set out in this Certification. Said belief is based on a review of the data submitted by the manufacturer and other information, and is based on the use of the product in accordance with the manufacturer's specifications.

*Specific Conditions*

1. EnSys, Inc. shall inform the user that the detectable concentrations apply to a specified Aroclor (Aroclor 1248), that the sensitivity of the assay to the various Aroclors does vary, and that it is important for the user to know what type of Aroclor is being tested and the general range of error if there is a different Aroclor, or a mixture of Aroclors, or if the Aroclors are weathered.

2. EnSys, Inc. shall keep users abreast of known interferences and matrix effects. As a minimum, users should know that the assay is not suitable for oily matrices and soils containing 1 to 10% or higher levels of petroleum hydrocarbons; also organic solvents may affect recovery. User should be aware of unacceptably low extraction efficiency in wet soils (water content of 30% or higher); for consistent results, soils should be dry and results expressed per gram of dry or dried soil.

3. EnSys, Inc. shall furnish the product with Material Safety Data Sheets for the instruction of users in the safety aspects of the product and its application.

4. User's Guide (Ref. 2) shall state under "Important Notice" that the manufacturer recommends that the user attend an eight-hour training/certificate course given by an EnSys, Inc. trainer or be trained by an experienced user.

5. The User Guide shall contain a clear indication of the shelf life of the reagents and a warning on the deterioration of reagents at high temperatures as may be encountered in transit and in field use.

*Basis for Certification*

Certification is based on a review of (1) application to the Department dated 24 January 1994; (2) User's Guide, 5th rev., 1 September 1993; (3) PCB RISc™ Product Field Studies (Summary of external validation studies with tabular material), undated; (4) PCB RISc™ Soil Kit Monoclonal Test, Internal Validation Results, EnSys, Inc. 30 June 1992; (5) PCB RISC® Polychlorinated Biphenyls Soil Test, Technical Guide, November 1992; (6) PCB Soil Test Stability, graph, FAX from EnSys, Inc. to G.W. Fuhs, 17 February 1994; (7) DOE Methods for Evaluating Environmental and Waste Management Samples, U.S. Department of Energy, Assistant Secretary for Environmental Restoration and Waste Management, DOE/EM-0089T, October 1993 (Method OS020); and (8) U.S. EPA Method 4020, Soil Screening for Polychlorinated Biphenyls by Immunoassay, U.S. EPA Office of Solid Waste, SW-846 Method Revision Draft 1, October 1992.

*Recommended Applications of the Test System*

The immunoassay is for the semiquantitative determination of PCBs in terms of a commercial mixtures of PCBs (Aroclor 1248) that has been used in the design and calibration of the assay. Conversion factors are applied to the results for Aroclors to which the assay responds differently. Unknown PCB mixtures need to be characterized by a reference method and a conversion factor needs to be determined which reflects the immunoassay response of that mixture relative to the response of Aroclor 1248. Without such an adjustment, results can be either high or low, depending on the affinity for the assay's antibodies of an unknown PCB mixture. A semiquantitative determination will provide a response, interpreted as either positive or negative, at one or several predetermined detection or target levels. Target levels are usually chosen to have relevance to a specific situation.

A comprehensive process of developing data quality objectives (DQO) was published by U.S. EPA under the U.S. Superfund Program. It provides guidance for analytical method QA/QC as applied to field investigations for PCB-contaminated soils. The process is intended for site-specific sampling plans. Here the immunoassay would generally qualify as a Level 2 (field analysis) method, subject to confirmation by a Level 3 method (identification and quantification, i.e., EPA Methods 8080 or 8081) applied predominantly to positive results. We recommend that minimum quality control should include method blanks and duplicates at 5 percent, or one per batch or per matrix, whichever is the more frequent, in addition to the samples required for confirmation. The use of proficiency evaluation and spiked samples should depend on project-specific needs.

We recommend gas-chromatographic U.S. EPA Methods 8080 or 8081 for establishing or confirming the types and concentrations of Aroclor(s).

**"Screening" and Preliminary Site Investigations**— The immunoassay can assist in preliminary site investigations ("Phase I"), if there are compelling historical data to indicate the presence of PCBs. If used on samples of largely unknown composition, without prior characterization by an approved, fully qualitative and quantitative laboratory method, confirmatory analysis is needed for every positive immunoassay result. No negative determinations can be made without taking into account the specificity of the assay and its possible susceptibility to interferences and matrix effects. A margin of error (above the stated detection level) should be allowed for those PCBs that may show a lower response than those for which the assay has been calibrated.

In the absence of other regulations and guidelines, we recommend that assay results be confirmed in the following manner:

(a) For the delineation of PCB contamination in a coherent mass of soil, the required frequency of confirmation by an approved method resulting in identification and quantification is at least 10 percent of the samples testing positive at the target or action level applicable at the site. In the event that fewer than ten samples meet these criteria, at least one positive sample shall be confirmed. Higher rates of confirmation apply if there is a potential for chemical interferences.

(b) 10 to 20 percent of positive results below the target or action level should be confirmed by an approved, fully quantitative method, except that a higher rate of confirmation may be necessary if the results are to be used in health risk assessments;

(c) 5 to 10% of all negative results, but no less than one result from each site or suspect area, should be confirmed.

If appropriate protocols are followed, the immunoassay can be used to great advantage to classify contaminated soils as to low, medium, or high con-

tamination and to determine which samples would provide the most information from laboratory analysis.

**Site Investigations and Remedial Actions**—Here the testing is expected to proceed under a site-specific Quality Assurance Project Plan (QAPP). Immunoassay and other field measurements will be "bracketed" in time and space by qualitative and fully quantitative analyses. Generally, a site is first characterized by the use of approved, fully qualitative and quantitative analytical methods as to the nature and level of contamination in key sampling locations and as to the presence of substances that may interfere with the use of the immunoassay. After such initial characterization, the immunoassay can be used in the comprehensive mapping of the site with respect to identified contaminant(s) to which the immunoassay responds. The percentage of samples that would be confirmed by another approved, fully quantitative method would be as stipulated in the QAPP; the project manager could call for additional confirmatory testing if such a need is indicated in the course of the investigation. During site cleanup, the QAPP would provide for use of the immunoassay to monitor progress. Confirmatory laboratory testing would occur before a decision on site closure is made.

*Regulatory Implications*

This immunoassay has been accepted as a Draft Method by the U.S. EPA Office of Solid Waste (SW-846 Collection of Methods, Method 4020, Revision Draft 1, October 1992). The Department's Certification is based on the technology's performance and by itself does not change the regulatory status of PCB testing; it should, however, facilitate and encourage the acceptance of this technology where a project's data quality objectives can be met by its use. To this end, the Department's findings should contribute to a consideration of this technology in regulated activities, depending on each regulated program's objectives and constraints.

State certification does not imply certification by the U.S. Government for use at federal superfund sites and other facilities under the jurisdiction of the U.S. Government for which state authorization for administrative oversight has not been granted. Under state implementation of the U.S. Resource Conservation and Recovery Act (RCRA), Treatment, Storage, and Disposal Facilities may contact state permitting agencies for use of the immunoassay for operational monitoring as part of a Waste Analysis Plan (WAP).

This Certification is issued as part of a pilot project to expedite the California Environmental Technology Certification Program. As a result, this Certification is subject to the conditions set out in the regulations to-be-developed, such as the duration of the Certification, the continued monitoring and oversight requirements, and the procedures for certification amendments, including decertification.

By accepting this Certification, the manufacturer assumes, for the duration of the Certification, responsibility for maintaining the quality of the manufactured materials and equipment at a level equal or better than was provided to obtain this Certification and agrees to be subject to quality monitoring by the Department as required by the law under which this Certification is granted.

## FORMALEX$^{R}$ FRC-3$^{TM}$

### American Bio-Safety, Inc. and S & S Company of Georgia, Inc.

*Technology Description*

The Formalex$^{R}$ FRC-3$^{TM}$ technology chemically treats aldehyde wastewaters in a batch processing system, which is a closed vessel, manual treatment unit. The spent aldehyde solutions are transferred to the collection vessel with Formalex$^{R}$ and are treated and rendered non-hazardous. After being tested with an aldehyde test kit, the solution with inert polymer residues may then be disposed of as a non-hazardous waste by discharge to the sanitary sewer.

The evaluated reagent for aldehyde waste treatment was Formalex$^{R}$. The apparatus utilized with the Formalex$^{R}$ is contained in the FRC-3$^{TM}$ kit which includes:

- 1 - 2.5 or 5.0 gallon reaction container
- 1 - large funnel w/strainer
- Formaldehyde test kit (HACH Formaldehyde Residue Test Kit, FM-1, sensitive to <500 ppm)
- Glutaraldehyde test kit (Pymah Corp., Residual Glutaraldehyde Indicator, sensitive to <4 ppm)
- pH indicator strips
- Laminated directions for FRC-3$^{TM}$ Kit and test kits
- Master of "Disposal Log Sheet"

*Certification Statement*

The Formalex$^{R}$ FRC-3$^{TM}$ is hereby certified, pursuant to California Health and Safety Code Section 25200.1.5, by the California Department of Toxic Substances Control (Department) as a Hazardous Waste Treatment Technology when operated, monitored, and maintained according to manufacturer's standards and specifications. The certified technology has been determined to treat incremental amounts of 10% Formalin (aqueous solution containing approximately 3.75% formaldehyde by weight) or up to 4% glutaraldehyde wastes. The use of the Formalex$^{R}$ process as directed has the potential to significantly reduce the exposure to aldehyde vapors, as well as the need for expensive waste hauling, and allows safe disposal of these treated wastes. Based on the certification process, the Department concludes that the

Formalex[R] process appears effective in reducing the concentration of aldehydes in 10% Formalin to less than 0.25 ppm or 4% glutaraldehyde aqueous solutions to less than 5.0 ppm, as claimed by the manufacturer.

*Certification Disclaimer*

The Department believes that the manufacturer's product and/or equipment, when used in accordance with the manufacturer's specifications, can achieve the performance level set out in this Certification. Said belief is based on a review of the data submitted by the proponent, results of onsite verification tests, and results of the verification tests performed in the Department's laboratory. The Department makes no express or implied warranties as to the performance of the manufacturer's product and/or equipment. Nor does the Department warrant that the manufacturer's product or equipment is free from any defects in workmanship or material caused by negligence, misuse, accident or other causes. This does not constitute an endorsement of the specific product, nor does it intend to expand existing rights or obligations, waive legal defenses, or otherwise affect the legal position of the applicant companies.

*Basis for Certification*

The Department reviewed data submitted by the proponent, which included copies of letters from hospitals, satisfied customers, and different state and local agencies, and test results from certified laboratories. In the first phase, the proponent conducted demonstration tests in the presence of Department's representatives at a typical user medical facility. In the second phase, the proponent conducted a demonstration test in the Department's laboratory. Finally, independent confirmation/verification tests were performed by the Department's Hazardous Materials Laboratory. Based on the evaluation of provided data and the results of these tests, the Department concluded that the Formalex[R] FRC-3[TM] process reduces the quantities and hazards of 10% Formalin or 4% glutaraldehyde wastes to a fraction of the original amount, suitable for disposal to sanitary sewer.

*Regulatory Considerations*

The Department intends to pursue regulatory certification for this technology after the adoption of regulations for such action. In the interim, the Department is addressing treatment of specific aldehyde wastes through Compliance Directive (EO-94-005-MM), "Treatment of Formaldehyde and Glutaraldehyde Sterilizing Solutions at Health Care Facilities".

Users of any 10% Formalin or glutaraldehyde treatment system may still be subject to all local discharge limits, including pH adjustment.

Staff of the State Water Resources Control Board, Pretreatment Program, have participated in the Certification evaluation, support its findings, and have determined that the use presents no burden to normal sewerage and wastewater treatment facilities.

*Protection of Human Health and the Environment*

Formalin and glutaraldehyde pose acute threats to the respiratory and digestive systems. Glutaraldehyde can be particularly aggressive in attack on the eyes and olfactory process. Formaldehyde is a probable human carcinogen. The use of Formalex[R], as an integral part of safe management practices, can provide valuable risk control and environmental protection.

Existing practices in dealing with 10% Formalin or 4% glutaraldehyde waste include:

1. Uncontrolled or illegal disposal;
2. Hazardous waste hauling, followed by off-site treatment and disposal;
3. Other treatment technologies.

These practices may not reduce occupational exposures, nor provide equivalent protection to human health and the environment. Additionally, some practices may subject responsible parties to State or local agency enforcement actions.

*Conclusions and Future Actions*

1. Duration of Certification:

   This Certification will remain in effect for the period of five years from its publication in the California Regulatory Notice Register, unless it is revoked for cause.

2. Continuous Quality Control/Quality Assurance:

   By accepting this Certification, the applicant companies accept, for the duration of this Certification, responsibility for maintaining the quality of the manufactured equipment and materials at a level equal or better than was provided to obtain this Certification.

3. Monitoring and Self-reporting Actions:

   The applicant companies have instituted appropriate internal quality control management systems and procedures, including a generator's waste treatment log. This log is considered by the Department suitable record for monitoring of the treatment and the generators record of performance. The Department may review and evaluate this record of performance and compare it to the standards and specifications provided to obtain this Certification.

4. Procedure for Modifications and Amendments:

   Modifications and amendments of this Certification may be requested by the applicant companies, and will be processed according to the provisions of the statute under which this Certification is granted.

5. Status as "Pilot Certification":
   This Certification is issued as part of the pilot project for the California Environmental Technology Certification Program. The pilot project's purpose is to delineate the practical aspects of the program that will be adopted in regulations which are under development. Consequently, this Certification may be subject to additional conditions which will be required in these regulations, including but not limited to, the duration of the certification, continuing monitoring and oversight requirements, and certification amendment procedures, including decertification.

rization or permit by rule. The main purpose of this rulemaking is to exclude tank cleaning activities from permitting requirements and standardize tank cleaning processes which will clarify when tanks become nonhazardous. The DTSC must determine that no alternative considered would be more effective in carrying out the purpose of this rulemaking or be as effective and less burdensome to affected persons than the proposed regulations.

AVAILABILITY OF TEXT OF REGULATIONS AND STATEMENT OF REASONS

Copies of the "Initial Statement of Reasons" and the text of the proposed regulations may be obtained from Ms. Joan Ferber of the DTSC's Environmental Analysis and Regulations Section as specified below. The information upon which DTSC relied is available at the above address.

POST-HEARING CHANGES

After the close of the comment period, the DTSC may adopt the proposed regulations. If substantive changes are made, the modified text will be made available for comment for at least 15 days prior to adoption. All persons who request the proposed regulations or who provide written comments will also be sent a copy of the modified text if substantive changes are made.

CONTACT PERSONS

Statements, arguments or contentions must be submitted in writing or during the public hearing in order for them to be considered before these regulations are amended or adopted. For more information regarding the regulation package, contact the DTSC as follows:

To be included in this regulatory package's mailing list, AND TO RECEIVE UPDATES OF THIS RULEMAKING, please contact the DTSC at (916) 324-9933.

Please direct all written comments, procedural inquiries and requests for documents to:

Ms. Joan Ferber
Department of Toxic Substances Control
Environmental Analysis and Regulations Section
400 P Street, 4th Floor
P.O. Box 806
Sacramento, CA 95812-0806

Inquiries regarding the technical aspects of this proposal may be directed to Ms. Diana Peebler at (916) 324-4754.

# GENERAL PUBLIC INTEREST

## DEPARTMENT OF FOOD AND AGRICULTURE

NOTICE IS HEREBY GIVEN that the Department of Food and Agriculture is changing the date of the public hearing scheduled for February 10, 1997 to Tuesday, **February 11, 1997**. The hearing will be held at 10:00 a.m., at the Fresno State Building, 2550 Mariposa Mall, Room 1036, Fresno, CA 93271. For additional information please refer to the notice published on December 27, 1996 in Register 96, No. 52-Z (File No. Z96-1210-07) on the topic of Direct Marketing.

## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### Notice of Final Decision to Modify a Hazardous Waste Environmental Technology Certification

The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) is providing this Notice of its final decision to modify the certification issued to S & S Company of Georgia, Inc., and American Bio-Safety, Inc., for their Formalex® FRC-3™ system for treating aldehyde wastes generated by medical, dental, and other health care facilities. Principal modifications to the certification include the removal of glutaraldehyde treatment from the certification; the clarification that the analytical test kit used in conjunction with the technology was not part of the certified technology; and the addition of specific conditions of use. The specific conditions of use emphasize the need for the user to work with the local sewer district or other applicable agencies, the need for the user to be aware of and follow applicable workplace health and safety practices, and the need for the user to validate and implement an onsite testing program in accordance with a Quality Program Plan to ensure that the wastes are effectively treated to meet disposal requirements.

Section 25200.1.5 of the Health and Safety Code authorizes DTSC to certify the performance of hazardous waste environmental technologies. Only technologies deemed not to pose a significant potential hazard to the public health and safety or to the environment when used under specified operating conditions, and which can be operated without specialized training and with minimal maintenance, may be certified.

The purpose of the program is to provide an in-depth, independent, technical evaluation of technologies to identify those meeting applicable quality

standards, so as to facilitate regulatory and end-user acceptance and to promote and foster growth of California's environmental technology industry.

DTSC makes no express or implied warranty as to the performance of the manufacturer's product or equipment. The end-user is solely responsible for complying with the applicable federal, state, and local regulatory requirements. Certification does not limit DTSC's authority to require additional measures for protection of public health and the environment.

On April 29, 1994, DTSC published a proposed decision and held a 30-day public comment period for the original certification. A final decision to certify the technology was published on July 8, 1994. The effective date of the original certification was August 8, 1994. Based on information received since the effective date of the original certification, and on a further review of the information used as the basis for the original certification, DTSC determined that modifications to the original certification language were warranted. Proposed modifications to the certification were published in the California Regulatory Notice Register on October 6, 1995. This Notice is of DTSC's final decision to modify the certification. Based on comments received during the public comment period, the final certification includes minor clarifications of the language and conditions stated in the proposed decision.

Questions related to this Notice of a final decision to modify the certification may be directed to:

California Environmental Protection Agency
Department of Toxic Substances Control
Office of Pollution Prevention and
Technology Development
P.O. Box 806
301 Capitol Mall, First Floor
Sacramento, CA 95812-0806
Attn: Dr. Bruce La Belle (916) 324-2958

A description of the technology, the **final** modified certification statement, and the certification limitations follows.

**FORMALEX® FRC-3™**
**American Biosafety, Inc. and S&S Company of Georgia, Inc.**

***Technology Description***

The Formalex® FRC-3™ technology is intended to chemically treat the formaldehyde in 10% neutral buffered Formalin (10% NBF) wastewaters in a batch processing system. The system consists of a closed reaction container containing Formalex® in which spent 10% NBF solutions are collected and treated. Formalex® reacts with the formaldehyde to form an inert polymer residue. After being tested with an appropriate test method to ensure that the formaldehyde has been sufficiently treated, the solution containing the inert polymer residues may be suitable for disposal by discharge to a sanitary sewer if it meets applicable local and/or State requirements.

The evaluated reagent for treatment of formaldehyde in 10% NBF waste was Formalex®. The FRC-3™ kit used with the Formalex® reagent includes the following components:

- One 2.5- or 5.0-gallon reaction container
- One large funnel with strainer
- Formaldehyde test kit (HACH Formaldehyde residue Test Kit, FM-1, Sensitive to <500ppm) [Note: Validation of this kit was not part of the evaluation]
- pH indicator strips
- Laminated directions for using the FRC-3™ Kit and the formaldehyde test kit
- Master of a "Disposal Log Sheet" for use by the customer

***Certification Statement***

The Formalex® FRC-3™ is hereby certified by the Department of Toxic Substances Control (DTSC), pursuant to California Health and Safety Code Section 25200.1.5, as a hazardous waste treatment technology when operated, monitored, and maintained according to the manufacturer's standards and specifications and in conformance with the Specific Conditions of Use imposed in this certification and in the California Health and Safety Code section 25201.5. The certified technology has been determined to treat formaldehyde in 10% neutral buffered Formalin (an aqueous solution containing approximately 3.75% formaldehyde by weight). Based on the certification evaluation, DTSC finds that the Formalex® process can substantially reduce the concentration of formaldehyde in 10% Formalin. The use of the Formalex® process as directed has the potential to reduce the exposure to formaldehyde vapors, and allow safer disposal of the treated waste.

***Specific Conditions of Use***

1. The user shall carefully read the Material Safety Data Safety Sheets (MSDSs) for Formalex® and the HACH or other analytical test kit, and understand safe work practices and precautions. Persons using these materials shall use adequate eye, face, and hand protection and know the location of the nearest eyewash.
2. The user shall work with their local sewer district and other applicable regulatory agencies to ensure compliance with potential discharge or other requirements (if any).
3. The user shall validate and implement an onsite testing program, in accordance with a Quality Management Plan, to ensure that their wastes are effectively treated to meet disposal requirements. As part of their quality system, the user shall test

each batch of treated waste for residual formaldehyde concentration and pH. Residual formaldehyde shall be measured using a field screening test kit, or by a U.S. EPA approved method for determination of formaldehyde. If the user uses a field screening test kit for the post-treatment testing of residual formaldehyde in the wastes, the user shall establish and implement a quality program to validate the applicability of the test kit, for each wastestream treated, by comparison to a standard reference method. At a minimum the program shall include analysis of a sufficient number of split samples by a U.S. EPA approved analytical method (e.g., EPA Method 8315) to represent the variability of the wastestreams and test methods. The user shall maintain records of all treatment logs, split sample results from the reference method (including identifying what samples were analyzed), and a description of the verification program under which the data was collected for the duration of the certification, or the period specified in Health and Safety Code section 25201.5(d)(5), whichever is longer. Upon request by DTSC, the user shall submit to DTSC copies of the split sample analyses, corresponding test kit results, or other records required by this certification.

***Certification Disclaimer***

DTSC believes that the manufacturer's product and/or equipment, when used in accordance with the manufacturer's specifications and the conditions specified in this certification, can achieve the performance level set out in this certification. Said belief is based on a review of the data submitted by the proponent, review of onsite treatment procedures, and results of limited tests performed in DTSC's laboratory. DTSC makes no express or implied warranties as to the performance of the manufacturer's product and/or equipment. Nor does DTSC warrant that the manufacturer's product or equipment is free from any defects in workmanship or materials caused by negligence, misuse, accident, or other causes. This certification does not constitute an endorsement of the specific product, nor does it intend to expand existing rights or obligations, waive legal defenses, or otherwise affect the legal position of the applicant. The end-user of this technology should assess its applicability to their specific wastestreams and waste management requirements.

The applicability of the HACH test kit for identification of formaldehyde was not evaluated for all potential wastestreams that may be treated with Formalex®. The user is cautioned that the presence of buffers in the 10% NBF may affect the ability of the test kit to detect residual formaldehyde. The user must validate the applicability of this or other test methods to their specific wastestreams.

***Basis for Certification***

The technology evaluation team included staff from DTSC and staff from the State Water Resources Control Board. The technology evaluation team members reviewed information submitted by the applicant, contacted three local Publicly Owned Treatment Works (POTWs) and a state agency with oversight over POTWs, observed treatment operations at two locations, and conducted limited tests in its own laboratory.

The information submitted by the proponent included copies of letters from hospitals, satisfied customers, and different state and local agencies, test results from independent commercial laboratories, product safety and toxicity information, and confidential technical information on the chemical reactions involved in the process.

Two of the POTWs contacted by the technology evaluation team prohibit discharge of untreated formaldehyde wastes into the sewer, but permit the discharge of wastes following treatment. The third POTW does not allow the disposal of formaldehyde at this time, even after treatment. This POTW indicated that they may be willing to permit discharge, following the use of a product where the non-reversible reaction causes a polymer to form, on a case-by-case basis. The other state contacted by the technology evaluation team leaves the decision regarding the use of any formaldehyde treatment up to the individual POTWs.

Team members observed a demonstration of the treatment operations conducted by the applicant at a hospital, and at a regional office of DTSC. DTSC conducted limited tests of the technology on fresh 10% NBF solutions. The 10% NBF was analyzed before and after treatment with Formalex® using the HACH test kit. The pH was determined before and after treatment. A blank was also analyzed. National Institute of Occupational Safety and Health (NIOSH) Method 3500 for formaldehyde was modified to provide a corroborating test. In addition, the precipitate that formed was dried, weighed, and tested for water solubility, pH (slurry), and melting (decomposition) point.

***Regulatory Considerations***

This certification is for treatment of formaldehyde in 10% NBF wastes using the Formalex® FRC-3™ technology. Health and Safety Code section 25200.1.5 and 25201.5, and California Code of Regulations section 67450.20, specify conditions under which certain technologies may be operated under the conditional exemption tier of the hazardous waste facility permit program requirements. Among the treatment activities covered by this section are, as specified in California Code of Regulations section 67450.20(b)(1), "the treatment of formaldehyde or

glutaraldehyde solutions by health care facilities using any technology that is certified as effective for that purpose by DTSC, pursuant to Health and Safety Code Section 25200.1.5. The treatment must be operated pursuant to the conditions imposed on the certification." As specified in section 67450.20(a), "the generator must comply with the conditions of Section 25201.5 of the Health and Safety Code." [Note: the Formalex® FRC-3™ process is only certified for the treatment of the formaldehyde in 10% neutral buffered Formalin wastes from the health care industry. Treatment of wastes containing glutaraldehyde are **NOT** authorized by this certification.]

This certification does not supersede other regulatory requirements. Users of any formaldehyde treatment technology are still subject to applicable federal, state, and local requirements, including, but not limited to, occupational health and safety requirements, local discharge limits (including pH adjustment), etc.

Use of this certification in any environmental marketing claims shall be consistent with section 5 of the Federal Trade Commission Act (15 U.S.C. 45), and title 16 part 260 of the Code of Federal Regulations, as well as with other applicable federal, State, and local requirements.

***Protection of Human Health and the Environment***

Formaldehyde in untreated formalin solutions poses acute threats to the respiratory and digestive systems. Formaldehyde is a probable human carcinogen. Improper management of formaldehyde wastes may pose threats to human health or the environment. Destruction of the formaldehyde serves to lessen these potential threats.

***Conclusions and Future Actions***

1. Duration of Certification:

   This certification will remain in effect until August 8, 1999, unless it is revoked for cause or unless a duration for certifications different from that specified in this certification is adopted in regulations. If a different duration is specified in regulations, the duration will be that provided for in the regulations beginning from the date of issuance of the original certification (August 8, 1994).

2. Continuous Quality Control/Quality Assurance:

   By accepting this certification the applicant accepts, for the duration of this certification, responsibility for maintaining the quality of the manufactured equipment, materials, and associated instructions and other documentation at a level equal to or better than was provided to obtain this certification.

3. Monitoring and Self-reporting Actions:

   The applicant has agreed to provide users with a master copy of a generator's waste treatment log (i.e., the "Disposal Log Sheet"). This does not affect the responsibility of the applicant or any user of the technology to comply with any applicable federal, State, or local laws or other requirements.

   A generator conducting treatment pursuant to the provisions of section 25201.5 of the Health and Safety Code shall meet all applicable conditions and requirements including, but not limited to, those specified in section 25201.5(d) and imposed as part of this certification.

4. Procedure for Modifications and Amendments at the Request of the Applicant:

   Modifications and amendments for this certification may be requested by the applicant, and will be processed according to the provisions in effect at the time an agreement is signed regarding such modifications or amendments.

5. Status as a "Pilot Certification":

   This certification was originally issued as part of the initial pilot phase of the California Hazardous Waste Environmental Technology Certification Program. The pilot phase's purpose was to delineate the practical aspects of the program that will be adopted in regulations which are under development. This certification may be subject to additional conditions required in these regulations, including, but not limited to, the duration of the certification, continuing monitoring and oversight requirements, and certification amendment procedures, including decertification.

## OFFICE OF ADMINISTRATIVE LAW 1996–97 COURSES IN RULEMAKING UNDER THE ADMINISTRATIVE PROCEDURE ACT

In cooperation with the Department of Personnel Administration, the Office of Administrative Law conducts two different training courses dealing with rulemaking under the Administrative Procedure Act (APA). All classes are held at the State Training Center, 1515 S Street, North Building, Suite 105, Sacramento, CA 94244-2350, (916) 445-5121 (CALNET 485-5121).

**#824—Rulemaking Under the Administrative Procedure Act**

Who: State administrative and technical staff involved in the rulemaking process.

What: A three-day workshop on the elements of the Administrative Procedure Act rulemaking process, how to draft a regulation and what the Office of Administrative Law looks for when reviewing a regulation.

# *CERTIFIED ENVIRONMENTAL TECHNOLOGY*

# *TECHNOLOGY TRANSFER ADVISORY*

# *SCIGEN NEUTRALEX*

expires January 24, 1998. For more information call Jan Smith of DTSC's Permit Streamlining Branch at (916) 324-0705.

## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### HOUSEHOLD HAZARDOUS WASTE UNIT STATE REGULATORY PROGRAMS DIVISION PUBLIC NOTICE FOR VARIANCE ISSUANCE

May 5, 1997, the State Regulatory Programs Division of the Department of Toxic Substances Control (DTSC) issued a variance to the City of Los Angeles. Authority for this action is contained in Health and Safety Code (HSC), section 25143. The variance was issued for the operation of mobile household waste collections to be conducted at:

**San Pedro Harbor**
Harbor Department Lot
700 block Front Street
San Pedro, CA 90731
May 8–10, 1997

**El Soreno**
Los Angeles Christian Presbyterian Church
2241 Eastern Avenue
Los Angeles, CA 90032
May 29–31, 1997

This variance allows the City of Los Angeles through their contractors to set up two mobile collection points at the listed locations for the specific dates and collect household hazardous wastes. No business or agricultural wastes are collected. Specific standards exempted are contained in the Health and Safety Code, section 25201 and Title 22, California Code of Regulations, Division 4.5, Chapter 20. The collections are subject to strict operating standards specified in the variance. For additional information contact Lee Halverson at the Department of Toxic Substances Control, Household Hazardous Waste Unit at (510) 540-3894.

## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### HOUSEHOLD HAZARDOUS WASTE UNIT STATE REGULATORY PROGRAMS DIVISION PUBLIC NOTICE FOR VARIANCE ISSUANCE

On April 30, 1997, the State Regulatory Programs Division of the Department of Toxic Substances Control (DTSC) issued a three year variance to Fresno County. Authority for this action is contained in Health and Safety Code (HSC), section 25143. The variance allows Fresno County temporary household hazardous waste collection facilities (THHWCFs) to accept from qualified conditionally exempt small quantity generators (CESQGs) up to 100 kilograms (220 pounds/27 gallons) of hazardous waste at one time, with a 100 kilogram limit per month. The variance also allows those qualified small businesses to transport up to that same limit to the THHWCFs without meeting registered transporter or hazardous waste manifesting requirements. Standards that are exempted are contained in the HSC, sections 25163(a) and 25160 respectively. Transported waste is shipped in accordance with federal Department of Transportation, California Highway Patrol, and California Vehicle Code requirements. For additional information contact Lee Halverson at the Department of Toxic Substances Control, Household Hazardous Waste Unit at (510) 540-3894.

## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### HOUSEHOLD HAZARDOUS WASTE UNIT STATE REGULATORY PROGRAMS DIVISION PUBLIC NOTICE FOR VARIANCE ISSUANCE

On May 5, 1997, the State Regulatory Programs Division of the Department of Toxic Substances Control (DTSC) issued a three year variance renewal to the City of Oxnard and Ventura County. Authority for this action is contained in Health and Safety Code (HSC) section 25143. The variance allows Oxnard and Ventura County temporary household hazardous waste collection facilities (THHWCFs) to accept from qualified conditionally exempt small quantity generators (CESQGs) up to 100 kilograms (220 pounds/27 gallons) of hazardous waste at one time, with a 100 kilogram limit per month. The variance also allows those qualified small businesses to transport up to that same limit to the THHWCFs without meeting registered transporter or hazardous waste manifesting requirements. Standards exempted are contained in HSC, sections 25163(a) and 25160 respectively. Transported waste is shipped in accordance with federal Department of Transportation, California Highway Patrol, and California Vehicle Code requirements. For additional information contact Lee Halverson at the Department of Toxic Substances Control, Household Hazardous Waste Unit at (510) 540-3894.

## CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY
## DEPARTMENT OF TOXIC SUBSTANCES CONTROL

### Final Decision to Certify Hazardous Waste Environmental Technology

The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) has

made a final decision to certify the following hazardous waste environmental technology:

The SCIGEN NEUTRALEX technology for treating formaldehyde in waste neutral buffered Formalin from histopathology specimen preservation and use of automated histopathology tissue processors.

Applicant: SCIGEN, Inc.
333 East Gardena Blvd.
Gardena, CA 90249

Chapter 412, Statutes of 1993, Section 25200.1.5, Health and Safety Code, enacted by Assembly Bill 2060 (AB 2060 by Assemblyman Ted Weggeland) authorizes DTSC to certify the performance of hazardous waste environmental technologies. Only technologies which are determined to not pose a significant potential hazard to the public health and safety or to the environment when used under specified operating conditions, and which can be operated without specialized training and with minimal maintenance, may be certified. Incineration technologies are explicitly excluded from the certification program.

The purpose of the certification program is to provide an independent technical evaluation of technologies to identify those meeting applicable quality standards, so as to facilitate regulatory and end-user acceptance and to promote and foster growth of California's environmental technology industry.

DTSC makes no express or implied warranties as to the performance of the manufacturer's product or equipment. The end-user is solely responsible for complying with the applicable federal, state, and local regulatory requirements. Certification does not limit DTSC's authority to require additional measures for protection of public health and the environment.

By accepting certification, the manufacturer assumes, for the duration of certification, responsibility for maintaining the quality of the manufactured equipment and materials and their operation at a level equal to or better than was provided to obtain certification and agrees to be subject to quality monitoring by DTSC as required by the statute under which certification is granted.

DTSC's notice of intent to certify was published on April 18, 1997 in the California Regulatory Notice Register 97, Volume No. 16-Z, pp. 846–852. Written comments in relation to the proposed certification received during the public review and comment period have been duly considered in the final certification as presented here. DTSC's final certification shall become effective on June 29, 1997.

Additional information supporting DTSC's final decision, including the DTSC technology certification evaluation report, are available for review. Requests for additional information or comments concerning this decision should be submitted to the following address:

California Environmental Protection Agency
Department of Toxic Substances Control
Office of Pollution Prevention and Technology Development
P.O. Box 806
301 Capitol Mall, 1st Floor
Sacramento, CA 95812-0806
Attn: Dr. Bruce La Belle (916) 324-2958

A description of the technology to be certified, the certification statement, and the certification conditions and limitations follows.

## CERTIFICATION PROGRAM (AB 2060) FOR HAZARDOUS WASTE ENVIRONMENTAL TECHNOLOGIES

## FINAL NOTICE OF CERTIFICATION

### TECHNOLOGY

SCIGEN NEUTRALEX Technology for Treatment of Aqueous Formaldehyde Wastes From the Health Care Industry

### APPLICANT

SCIGEN, Inc., Gardena, California

### Technology Description

The patented SCIGEN NEUTRALEX technology is a batch chemical treatment process designed to treat aqueous formaldehyde wastes. The technology is based on the reaction of formaldehyde with a sulfuric reducing agent. This certification evaluation is specific to its use for treating the formaldehyde in waste 10% neutral buffered Formalin (10% NBF) from histopathology tissue specimen preservation and from the operation of automated histopathology tissue processors. The technology consists of:

- NEUTRALEX reagents as a powder prepackaged in a foil packet. The currently available packets are designed to contain sufficient ingredients to treat one gallon of 10% NBF waste per packet.
- A container in which the reagents are mixed with the waste Formalin; SCIGEN supplies a five-gallon container, but other suitable containers may be used.
- Instructions for the proper use of the technology.
- A Material Safety Data Sheet (MSDS).
- A master copy of a log sheet for recording the results of each batch treatment.

Formaldehyde is commonly prepared in industry as approximately a 37% aqueous solution by weight. This formaldehyde solution is referred to as Formalin (formerly trademarked). Commercial formulations sold and used in the health care industry are typically

prepared by the tenfold dilution of Formalin along with the addition of buffers to maintain a neutral pH and 1.0–1.5% methanol to stabilize the formaldehyde. It is referred to as "10% neutral buffered Formalin (10% NBF)." 10% NBF contains approximately 3.7% formaldehyde by weight. The amount of 10% NBF waste generated at a health care facility typically ranges from a few gallons per week to a few gallons per day. Formaldehyde is toxic to humans and other species by ingestion, inhalation, and other exposure routes. Practices for managing 10% NBF waste include shipment off-site as a hazardous waste, on-site treatment, or disposal to sewer (where legal). SCIGEN's NEUTRALEX technology is intended to provide a safe and effective option for on-site treatment of these wastes.

After removal of any residual tissue from the waste by filtration with an 80-mesh or smaller filter, the waste is placed into the reaction container. For each gallon of waste to be treated, one packet of NEUTRALEX is opened and its contents poured into the reaction container. The container is closed, stirred, and allowed to stand for 15 minutes while the reaction occurs. After being tested with an appropriate test method to ensure that the formaldehyde has been satisfactorily treated, the solution may be suitable for disposal to the sanitary sewer where it meets applicable local and/or state discharge requirements.

Along with the technology, SCIGEN supplies a screening test kit for field-testing treated solutions for residual formaldehyde; however, SCIGEN's screening test kit is not considered part of the technology undergoing a certification evaluation, and is not a certified or a standard test method.

### Certification Statement

The SCIGEN NEUTRALEX technology is hereby certified by the Department of Toxic Substances Control, pursuant to California Health and Safety Code Section 25200.1.5, as a hazardous waste treatment technology when used, monitored, and maintained according to the manufacturer's standards and specifications and the conditions imposed by this Certification. The certified technology has been determined to be effective for treatment of waste from use of 10% neutral buffered Formalin (an aqueous solution containing approximately 3.7% formaldehyde by weight, with added buffers to maintain a neutral pH and about 0.5–1.5% methanol as a preservative) for histopathology tissue specimen preservation and automated tissue processors in the health care industry. The technology is a batch process that treats wastes in increments of liters or gallons. The technology has been shown to be capable of achieving reductions in formaldehyde concentration in the wastes to less than 10 ppm residual formaldehyde when used in accordance with SCIGEN's standard operating procedures. The effectiveness of the treatment for each treated batch must be verified using an appropriate test method. The appropriateness of the SCIGEN screening test kit or other non-standard test method must be verified for each wastestream by comparison to a standard test method.

By treating the formaldehyde in the waste 10% neutral buffered Formalin solution, use of the SCIGEN NEUTRALEX technology as directed has the potential to reduce the exposure to formaldehyde vapors and allow safer management and disposal of the treated wastes. The technology does not generate insoluble polymeric reaction products. Conditions imposed on the user as part of this certification include requirements for worker safety and training, operation of the technology, testing of treated wastes, validation of the test method used, and documentation and recordkeeping. Conditions imposed on the manufacturer include requirements for maintaining quality and providing assistance to the user. The conditions of this certification are specified in detail below.

### Specific Conditions

This certification is conditioned upon conformance with the following specific conditions imposed on the user and the manufacturer of the technology:

#### A. Conditions Imposed on the User of the Technology.

Users of the SCIGEN NEUTRALEX technology shall conform to the following conditions:

1. Safety. The user shall carefully read the Material Safety Data Sheets (MSDSs) for the NEUTRALEX reagents and the screening test kit, and understand safe work practices and precautions. Persons using these materials shall use adequate eye, face, and hand protection and know the location of the nearest eyewash. Treatment shall be performed in a hood or other area with adequate ventilation, and with secondary containment. The health care facility shall document how it determines that adequate ventilation is provided.
2. Training. All users shall be trained in the proper use of the technology. Training shall be documented.
3. Compliance with discharge requirements. The user shall maintain adequate records to demonstrate that it is in compliance with all applicable pretreatment standards and with all applicable industrial waste discharge requirements issued by the agency operating the publicly owned treatment works (POTW) into which the wastes are discharged.

4. Standard operating procedures. The user shall follow the standard operating procedures provided by SCIGEN.

5. Testing. The user shall test each batch of treated waste for residual formaldehyde concentration and pH. Residual formaldehyde shall be measured using a screening test kit or by a U.S. EPA approved standard method for determination of formaldehyde (e.g., U.S. EPA SW-846 Method 8315).

6. Validation of test method. If the user uses a screening test kit or other non-standard method for the post-treatment testing of residual formaldehyde in the wastes, the user shall establish and implement a program to validate the applicability of the test method. The user shall validate the non-standard test method for each waste stream treated by comparison to a U.S. EPA approved standard method for formaldehyde. At a minimum, the program shall include analysis of a sufficient number of split samples by the U.S. EPA approved analytical method to represent the variability of the waste streams and test methods. The user shall maintain records of all treatment logs, split sample results from the reference method (including identifying what samples were analyzed), and a description of the verification program under which the data were collected for the duration of the certification. Upon request by DTSC or other applicable state or local regulatory agencies, the user shall provide copies of records required by this certification.

7. Identification of problems and corrective action. The user shall notify SCIGEN and DTSC of any problems encountered with use of the NEUTRALEX technology, and work with SCIGEN, as appropriate, to resolve them. The user shall maintain a record of any problems encountered from use of the technology and the corrective actions taken.

8. Compliance with conditions under Conditional Exemption. A user operating the NEUTRALEX technology under conditional exemption as specified in Title 22, California Code of Regulations, Section 67450.20, and Health and Safety Code, Section 25201.5, shall comply with all the conditions of Section 25201.5 of the Health and Safety Code.

9. Recordkeeping. The user shall maintain a record of all treatments using NEUTRALEX, including the date, quantity treated, pH, residual formaldehyde concentration, and identification of the person conducting the treatment. All records specified under these conditions shall be maintained on-site for a period of not less than three years.

**B. Conditions Imposed on SCIGEN, the Manufacturer of the Technology.**

SCIGEN shall conform to the following conditions:

1. SCIGEN shall maintain the quality of the technology at a level equal to or better than that used as the basis for certification.
2. SCIGEN shall assist users, as appropriate, to incorporate SCIGEN's standard operating procedures into the user facility's management system.
3. SCIGEN shall maintain their own management system at a level equal to or better than that in use during the evaluation. This includes, but is not limited to, maintaining their self-assessment, contingency plan, corrective action, and training system.
4. SCIGEN shall assist users to train operators of the technology to perform the treatment operations in accordance with the standard operating procedures.
5. SCIGEN shall provide users with copies of the standard operating procedures for their technology.
6. SCIGEN shall provide users with copies of material safety data sheets conforming to the requirements of 29 Code of Federal Regulations 1910.1200 (29 CFR 1910.1200).
7. SCIGEN shall assist users, as appropriate, to resolve any problems that the users encounter with use of the technology.

**Certification Limitations/Disclaimer**

This Certification is specific to the treatment aspects of the technology. The Certification does not supersede the authority of applicable regulatory agencies to regulate the technology for a particular use or at a particular facility. Where appropriate, the U.S. Environmental Protection Agency, the State Water Resources Control Board, the Regional Water Quality Control Boards, local water districts, and/or other federal, state, and local agencies should be contacted for information on regulatory requirements related to the use of NEUTRALEX at a particular facility.

This Certification is not intended to infringe upon or otherwise affect the activities of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), the College of American Pathologists (CAP), or other independent health care facility or laboratory accreditation bodies. Where applicable, such organizations should be contacted for more information on their requirements.

The Department makes no express or implied warranties as to the performance of SCIGEN products

or equipment. Nor does the Department warrant that the SCIGEN NEUTRALEX products are free from any defects in workmanship or material caused by negligence, misuse, accident, or other causes. Other than as described in this document, the Department has not conducted independent testing to confirm the information submitted by SCIGEN, published in the literature, or gathered from other sources. DTSC has not reviewed SCIGEN's MSDS for conformance to 29 CFR 1910.1200.

The Department does believe, however, that the manufacturer's product or equipment can achieve the performance levels set out in this Certification when used in accordance with the manufacturer's specifications. Said belief is based on a review of 1) data and information submitted by SCIGEN, 2) a field demonstration conducted at two health care facility laboratories, and 3) information gathered from independent sources.

This Certification is issued as part of a pilot project for the California Environmental Technology Certification Program, which has been established under the authority of the Health and Safety Code, Division 20, Section 25200.1.5. The pilot project's purpose is to delineate the practical aspects of the program that will be adopted in regulations. This Certification may be subject to additional conditions that will be required in these regulations, including, but not limited to, the duration of the Certification, continuing monitoring and oversight requirements, and Certification amendment procedures, including those for decertification.

This Certification is specifically limited to the treatment of liquid 10% NBF waste from pathology laboratory tissue preservation and from automated tissue processors. The scope of this Certification does not include treatment of other waste streams, or treatment of formaldehyde formulations containing ingredients other than aqueous formaldehyde, inert buffering agents and methanol stabilizer. The MSDS should be reviewed for specific information on incompatibilities.

## Basis for Certification

The certification evaluation included a consideration of the scientific principles behind the technology; a review of studies conducted by SCIGEN; participation in field demonstrations at two health care facilities; and discussions with end users. Detailed results of the certification evaluation are presented in the DTSC Certification Evaluation Report for this technology.

### Scientific Principles

NEUTRALEX is a proprietary mixture of specific ingredients combined in proportions optimized to achieve the observed results. The reaction chemistry, and thus the adequacy of the treatment, depends on the exact chemicals present in the reaction mixture and the amounts of each chemical used.

The underlying scientific principles are based on the patented reaction of a particular sulfuric reducing agent with aqueous formaldehyde at near-neutral pHs. SCIGEN asserts a proprietary interest over their formulation which containing this reducing agent plus other key ingredients. The scientific basis for the reactions are described in more detail in the DTSC technology certification evaluation report.

There is substantial literature precedent for reactions of this particular sulfuric reducing agent with formaldehyde or related aldehydes. The reaction of the reducing agent with aqueous Formalin to produce sodium hydroxymethanesulfonate has been patented. It has been studied as a reagent in a method for air sampling for formaldehyde. Its addition to urea resins used in the manufacturer of resin-bonded particle board has been studied as a way to reduce formaldehyde emissions from the board. The reducing agent has also been identified in a patent as a way to prepare a sulfonated melamine-formaldehyde resin with very low free formaldehyde content. Its reaction with dilute aqueous glutaraldehyde has been patented as a way to prevent turbidity and precipitation. It has also been studied as a reagent for the titrimetric analysis of glutaraldehyde.

SCIGEN provided DTSC with a mechanistic pathway and experimental data on major reaction products expected from the mechanism. The mechanism predicts specific products, and a ratio in which they could be formed. To support the mechanism SCIGEN submitted data including a melting point and a C,H,N, and S analysis supporting the formation of a major product expected by the mechanism. They reported the results from an experiment in which they isolated approximately 75% of the amount of this compound predicted by the mechanism. This result, where they did not attempt to optimize their isolation method, provides good support for the proposed mechanism.

### Existing Data and Information

DTSC staff visited SCIGEN's facility to discuss SCIGEN's management and operations and to review related documents. SCIGEN maintains documented procedures for handling, storage, packaging, preservation, and delivery of the product, and other customer services. SCIGEN also documents procedures to review their operations and perform internal audits, calibrations, and testing, and to collect, track, and resolve user complaints or product failures. A toll-free telephone number is available for customers to request information or assistance, or present complaints.

During the site visit, DTSC staff confirmed that experiments from product research, development, and testing were retained in notebooks and available for review. The notebooks predated SCIGEN's entry into the certification program. The notebooks showed the progression of the development of the technology. SCIGEN's internal studies and experiments used SCIGEN's modification of ASTM Method D-2194 and the SCIGEN screening test kit to determine formaldehyde concentrations.

SCIGEN submitted a summary of an internal experiment to demonstrate the repeatability of the treatment process. They treated ten batches of unused 10% NBF according to their standard operating procedures. The batches were treated over a period of twelve weeks. Post-treatment pHs were between 6.4 and 6.5. The post-treatment formaldehyde concentrations were between 49 and 58 ppm according to their modification of ASTM Method D-2194, and between 10 and 20 ppm by SCIGEN's Screening Test Kit. The data are consistent with SCIGEN's statements that the reaction repeatably gives low residual formaldehyde concentrations. No quality assurance/quality control (QA/QC) data were submitted for the experiment. In the absence of QA/QC data, the data are best considered as qualitative or semiquantitative. They were used to help identify objectives for field demonstrations, and reviewed for consistency with the results of the field demonstrations and information from end users.

SCIGEN also submitted laboratory data from aquatic bioassay 96-hour $LC_{50}$ tests performed on two untreated and two treated wastes collected from each of two health care facility wastes. An independent California Department of Health Services Certified Laboratory performed the bioassays. The results showed no fish mortality in post-treatment wastes, indicating an aquatic $LC_{50}$ >750 mg/kg. The pH during the bioassay was approximately 6.5–7.0, compared to a pH of 7.5 for a control tank.

**Field Demonstrations**

As part of the evaluation, DTSC participated in a short-term demonstration of the technology at two pathology laboratories, Kaiser-Berkeley and Kaiser-Bellflower. The purposes of the demonstration were to:

- Observe the use of the technology under field conditions,
- Obtain confirmatory data from an unbiased laboratory independent from SCIGEN, DTSC's Hazardous Materials Laboratory (HML),
- Generate data using three analytical methods to provide complementary data related to SCIGEN's claims, and to support the utility of existing data previously generated by SCIGEN and end users. The three methods are:
  - EPA Method 8315, using derivatization followed by analysis by High Performance Liquid Chromatography—performed by HML;
  - ASTM Method D-2194, using derivatization followed by titrimetric analysis to measure base released during the derivatization—performed by SCIGEN;
  - SCIGEN's field screening test kit for residual formaldehyde—performed by HML, SCIGEN, and the Kaiser laboratory.

A summary of these methods is included in the DTSC Certification Evaluation Report for this technology. SCIGEN provided the two Kaiser pathology laboratories with the NEUTRALEX technology, and demonstrated the technology's use. Kaiser pathology laboratory staff performed the treatment, while DTSC staff observed the operations. The two Kaiser pathology laboratories are regional facilities that prepare pathology specimens for a number of hospitals.

The Kaiser-Berkeley facility typically generates about five gallons of tissue processor waste and about two to three gallons of histopathology waste per day. At the Kaiser-Berkeley facility, a staff technician treated the two wastestreams, and poured the samples into the pre-labeled sample jars. The same technician conducted the operations each week. After 15 minutes, the technician tested the pH, then used SCIGEN's screening test kit to test for residual formaldehyde. At the Kaiser-Bellflower facility, the demonstration was carried out in a manner similar to that at Kaiser-Berkeley, however insufficient tissue processor waste was available for treatment. DTSC personnel were present during the demonstration activities.

Samples of the wastes before and after treatment were shipped to HML and to SCIGEN from the Kaiser facilities. HML treated an aliquot of the untreated wastes with the NEUTRALEX according to the directions accompanying the technology, with the following modification: since less than one gallon was treated, the package of NEUTRALEX was weighed, and a proportionate amount to achieve the same ratio as one package per gallon of waste was used. Samples analyzed at HML included samples generated at Kaiser-Berkeley during both field study treatment days, and at Kaiser-Bellflower during the second study treatment day. Analyses were performed in accordance with HML's quality assurance and quality control procedures. The EPA Method 8315 analyses were run as routine analyses. The analysts were advised of the presence of buffering agents that could influence the derivatization of formaldehyde during this analytical method. Treatment of samples with NEUTRALEX

and SCIGEN screening test kit analyses were run as a special project, since the procedures used did not follow standard methods. The screening tests and pH measurements were run according to the directions and equipment supplied with the technology. HML staff noted that during treatment the temperature of the solution rose from room temperature (not recorded) to 33 degrees Celcius.

SCIGEN analyzed the samples that they received using their modification of ASTM Method D-2194. This method relies on the reaction of formaldehyde with excess sodium bisulfite, followed by titration of the hydroxide ion released as part of the reaction. SCIGEN analyzed each sample using this method. In addition, each treated sample was analyzed for pH using a pH meter and for formaldehyde using the SCIGEN screening test kit. SCIGEN did not submit any QA/QC data associated with their analyses.

Data from the three test methods gave consistent results. Blanks, with and without NEUTRALEX, showed no detectable formaldehyde. The detection limit for EPA Method 8315 was 0.1 mg/L for treated samples and blanks. Samples known to contain 10% NBF (approximately 37,000 ppm formaldehyde) gave readings of between 34,000 and 41,000 by EPA Method 8315, and between 34,400 and 43,200 by SCIGEN's modification of ASTM Method D-2194. Samples that had been treated gave readings of between <0.1 mg/L and 2 mg/L by EPA Method 8315, and between 28 and 76 mg/L by SCIGEN's modification of ASTM Method D-2194. According to SCIGEN, ASTM Method 2194 (and their modification) is biased high for determination of formaldehyde in 10% NBF due to the presence of the buffers that interfere with the titration (i.e., it requires more acid to titrate the solution back to its initial pH). Because of the limited data, statistical tests were not performed. The results are also consistent with the results from SCIGEN's internal studies on other wastes.

The results from EPA SW-846 Method 8315, a standard analytical method, were considered the most reliable and accurate of the three methods used to provide data for the evaluation. The results from use of this method during the field demonstrations consistently gave results showing less that 10 ppm formaldehyde in treated wastes. However, since the data are limited, a condition of the certification is that each end user validate the effectiveness of the technology on their wastes.

### Discussions With End Users

The NEUTRALEX technology was discussed with representatives from eight health care facilities. Six of the eight facilities use the technology and are satisfied with the product. The other two do not currently use the technology for administrative reasons unrelated to its performance. One of the two stated that they had conducted limited tests of the technology, and that it appeared to work well. They stated that they may decide to use the technology in the future. The six users did not identify any problems with use of the NEUTRALEX. Four of the six treat between one and five gallons per week, while the other two treat 10–15 gallons/week. Four of the users treat both wastestreams, while the others treat only histopathology tissue specimen preservation wastes. Four of the six stated that they prefer the technology to competing technologies that generate a precipitate. Five of the six users stated that SCIGEN visited their facility to train them on use of the technology. The other user stated that they observed a demonstration at a trade show. All users said that they felt the technology was easy to use, and works well. Only three of the six users test the wastes following treatment. SCIGEN submitted copies of log sheets from Hoag Memorial Hospital recording four months of treatment with NEUTRALEX. During the four-month period, Hoag Memorial Hospital treated a total of 116 gallons. Treatment was usually carried out in two-gallon batches, every 1–3 working days. The log shows a range of recorded residual formaldehyde concentrations of 0–10 ppm measured using SCIGEN's screening test kit. The post-treatment pHs ranged from 5.5 to 7.75. The other two users who test their wastes indicated that the test kit showed similar low levels of residual formaldehyde in their treated wastes.

### Regulatory Considerations

Title 22, California Code of Regulations, Section 67450.20, specifies that treatment of formaldehyde by health care facilities using any technology certified as effective for that purpose is authorized for operation under a grant of conditional exemption. The treatment must be operated pursuant to the conditions imposed on the certification. In addition, the generator conducting the treatment must comply with the conditions of Section 25201.5 of the Health and Safety Code. The reader should refer to these statutory and regulatory sections for additional information.

### Duration of the Certification

This certification will remain in effect for the period of three years from the date of issuance, unless it is revoked for cause or unless a duration for certification different from that specified in this certification is adopted in regulations. If a different duration is specified in regulations, the duration of this certification will be that provided for in the regulations, beginning from the date of issuance of this certification.

# *APPENDIX D*

# *TIERED PERMITTING FACT SHEET 1772B—CONDITIONAL EXEMPTION FOR SPECIFIED WASTE STREAMS*

*TIERED PERMITTING FACT SHEET 1772B*

# Conditional Exemption for Specified Wastestreams

October 1996

California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC)

## ABOUT TIERED PERMITTING

This fact sheet describes the requirements for fixed treatment units operating under the Conditional Exemption Tier for Specified Wastestreams (CESW). It is designed to assist you in determining if this status applies to your operation. It is also designed to assist you in understanding the various administrative and technical operating requirements that you must meet in order to operate under CESW.

The Wright-Polanco-Lempert Hazardous Waste Treatment Permit Reform Act of 1992 (Assembly Bill 1772) established a five-tiered program for authorizing hazardous waste treatment and/or storage at businesses required to have State authorization to treat or store hazardous waste but do not require a hazardous waste facility permit under federal law.

If you are not sure which tier or tiers apply to your operations, you should refer to Department of Toxic Substances Control (DTSC) Onsite Hazardous Waste Treatment Notification Form or DTSC Onsite Tiered Permitting Flow Chart, which graphically displays the eligible wastestreams and treatment processes by tier.

After reviewing this fact sheet, if you still have questions regarding the applicability of these tiers to your operation, please call the DTSC Regional Office nearest you at the phone numbers shown on the map on back page.

## DEFINITIONS:

### A Fixed Treatment Unit (FTU) is:

- any equipment which performs hazardous waste treatment that is permanently stationed at a single facility regardless of the period or frequency of treatment.

### Treatment is:

- any process or method designed to change the character or composition of a hazardous waste.*

*[This revised definition is effective January 1, 1997 and was amended by Assembly Bill 2776 (Chapter 999, Statutes of 1996). The previous definition did not require that the process be designed to change the waste in order to constitute treatment.]

### A Unit is:

- a combination of tanks or tank systems and/or containers located together that are used in sequence to treat one or more compatible hazardous wastestreams. The devices are either plumbed together or otherwise linked so as to form one treatment system.

Note: Legal citations reading 66XXX.XX or 67XXX.XX and references to chapters and articles refer to sections within Title 22, California Code of Regulations (CCR), Division 4.5. Legal citations reading 25XXX.X refer to Chapter 6.5 of Division 20 of the California Health and Safety Code (HSC).

### A Transportable Treatment Unit (TTU) is:

- any mobile equipment that performs treatment, is transported onto a facility to perform treatment, and is not permanently stationed at a single facility.

### A Certified Unified Program Agency (CUPA) is:

SB 1082 (1993) established a local Certified Unified Program Agency (CUPA) to consolidate six program elements at the local level, including hazardous waste generator and onsite treaters, hazardous material inventory and business plans, and above and underground tanks. By January 1, 1997, most of DTSC's responsibilities to implement the generator and onsite treatment programs will be transferred to the CUPAs.

IN THIS FACT SHEET:

## ELIGIBILITY:

Eligible wastestreams and treatment processes are limited to those listed in HSC Section 25201.5 (c) (abbreviated as §25201.5 (c)), plus technologies certified by DTSC pursuant to HSC §25200.1.5. A listing of these wastestreams and treatment processes is included in this fact sheet.

- There are no general volume limitations under this tier, with two exceptions. The treatment of hazardous effluent from the processing of silver halide-based imaging products is limited to no more than 500 gallons treated in any calendar month. In addition, the separation of oil/water mixtures and separation sludges is limited to an average of less than 25 barrels of oil recovered per month.

- You may only treat waste that you generate onsite.

- You are <u>not</u> eligible for CESW if the treatment activity requires a federal hazardous waste treatment permit under the Resource Conservation Recovery Act (RCRA) program.

**Treatment in the following units is ineligible for CESW:**

- landfills,
- surface impoundments,
- injection wells,
- waste piles,
- land treatment units, and
- thermal destruction units.

**Transportable Treatment Units:**

You may contract with a transportable treatment unit (TTU) owner or operator, to provide onsite treatment under your CESW authorization. The TTU must operate in compliance with all of the standards established for CESW.

TTUs can now also operate under CESW independent of the generator's authorization status. TTU owners or operators wishing to operate directly under CESW, should contact DTSC HQ for the appropriate notification forms. For additional guidance on TTUs please read the fact sheet on Transportable Treatment Unit Operation under Permit by Rule (PBR)/Conditional Exemption.

## OPERATING REQUIREMENTS:

If you intend to operate under CESW, you must comply with all of the following requirements.

**Notification:**

If you plan to conduct a treatment activity that is eligible for CESW, you must submit a completed notification form to DTSC and the local enforcement agency not less than **60 days before** commencing the first treatment of waste. (DTSC may shorten the time period between notification and authorization when the owner or operator shows good cause.)

- In order to meet the notification requirement, you must submit a facility specific notification (DTSC Form 1772) and a unit specific notification (DTSC Form 1772B). These forms are available from DTSC's Regional or Headquarters offices. These forms are periodically revised to reflect legislative or regulatory changes.

- TTU's operating independently under CESW must use DTSC form 1199 for unit notification and DTSC form 1198 for site notification.

- Each notification shall be completed, dated, and signed according to the requirements of §66270.11 of Title 22, CCR.

- If mailed, the notification forms must be sent by certified mail, with return receipt requested. You may also submit the forms in person. Currently, two sets of the notification must be submitted to the DTSC Headquarters office in Sacramento and one set to the local enforcement agency. Please refer to Appendix 2 of DTSC Onsite Hazardous Waste Treatment Notification Form Instructions for the list of local enforcement agencies.

- Submit amended Forms 1772 and 1772B whenever there is any change to the information contained in the most recent notification submitted to the DTSC.

- DTSC is in the process of writing regulations to transfer the notifications and authorization process for the onsite tiers (Permit by Rule (PBR), Conditional Authorization (CA), and CE) to the CUPAs. You will be notified by DTSC when this occurs.

**After January 1, 1997, please consult with your DTSC regional office and/or your local agency to determine if notification responsibility has moved prior to submitting your notification.**

## GENERATOR OPERATING STANDARDS:

Generators conducting treatment under CESW must comply with hazardous waste generator standards. Many of the general requirements that apply to generators may be found in 22 CCR in Chapter 12, beginning with §66262.10. These requirements include:

**General**

- determining whether or not a waste is hazardous (§66262.11),
- obtaining an identification number (§66262.12),
- keeping records of items such as manifests, reports, tests & analyses (§66262.40),
- submitting reports such as the biennial report & exception reports (§66262.41 through §66262.43),
- obtaining necessary permits or authorization and complying with applicable requirements for treatment, storage and disposal activities (§66262.10),
- complying with requirements for waste pesticides and pesticide containers generated by farmers (§66262.70), and
- complying with land disposal restrictions by ensuring that all waste that is land disposed meet applicable treatment standards (Chapter 18).

**Accumulation**

When a generator accumulates and stores hazardous waste at the site of generation, and subsequently ships the waste off-site for recycling, treatment or disposal, certain requirements apply. These requirements include:

- complying with accumulation times and procedures (§66262.34)
- using appropriate containers and storing them properly (§66265.170 through §66265.177)
- complying with applicable requirements for tank systems (§66265.190 through §66265.199, except §66265.197(c))
- using only a registered hazardous waste transporter (§66263.10)
- using a manifest for hazardous waste shipments (§66262.20 through §66262.23)
- properly packaging, labeling, marking and placarding hazardous waste shipments (§66262.30 through §66262.33)
- complying with special requirements for international shipments (§66262.50 through §66262.60)
- completing a land disposal restrictions notification statement (§66268.7).

**Planning**

Generators that accumulate hazardous wastes must also comply with requirements that both prevent foreseeable accidents and assist in preparation for emergencies. These requirements include:

- properly designing and operating the facility (§66265.30 through §66265.37),
- administering an employee training program (§66262.34(a)(4) and §66265.16),
- preparing a contingency plan outlining procedures for emergencies (§66265.50 through §66265.56). Por tions of the hazardous material business plan may serve to fulfill the requirements of the contingency plan (and/or vice versa). The business plan is required by the California Health and Safety Code, Division 20, Chapter 6.95.

Source reduction plans and reports are required by the California Health and Safety Code (HSC), beginning with §25244.12 for companies generating greater than 12,000 kg of hazardous waste per year.

**Generator Fees**

Payment of applicable fees, which, depend upon:

- the amount of waste generated,
- the size of the generator and
- the type of activities undertaken, which may include, but are not limited to, disposal fees (HSC §25174.1 to §25174.6), generator fees (HSC §25205.5), waste reporting surcharge (HSC §25205.9), environmental fees (HSC §25205.6), and manifest fee (HSC §25160.5).

## FINANCIAL ASSURANCE:

Generators treating their waste under CESW are exempt from the requirement to have third party liability coverage for environmental accidents and from having to provide closure financial assurance.

## FEES:

- Pursuant to HSC §25205.14(c), the initial notification fee for CESW is $100, which will be billed to your company by the California Board of Equalization (BOE), (a state tax collection agency).

- Every calendar year thereafter, you will be billed by BOE for a fee in the amount of $50.

- SB 1291 changed the onsite treatment fee system so that companies will only pay a fee on the highest tier they operate. Previously, a separate fee was charged for each tier. The fees for many onsite treatment facilities will be reduced in 1996.

**Upcoming Change:**

- By January 1, 1997, most of DTSC's responsibilities to implement the generator and onsite treatment programs will be transferred to the CUPAs who will establish appropriate local fees to support their Unified Program. DTSC's onsite Tiered Permitting fees will be eliminated in jurisdictions where CUPAs are certified. You will be notified by the local CUPA as these certifications occur.

## CORRECTIVE ACTION:

Corrective Action includes assessing the property for any previous release of hazardous wastes (using the Phase I Environmental Assessment Checklist) and cleaning up any contamination that poses a risk to public health and the environment. All CESQT and CESW generators are exempt from the Phase I Environmental Assessment Checklist requirements.

## CONTAINERS:

If you are treating hazardous wastes in containers, you must follow the interim status standards for container storage and treatment found in Article 9 of Chapter 15 (Title 22, CCR, §66265.170 through §66265.177). This includes, but is not limited to, proper management of the container(s) to prevent leaks and weekly inspection of the storage area.

## TANKS:

If you are treating hazardous wastes in tanks, you must follow the interim status standards for storage or treatment of hazardous wastes in tanks and tank systems found in Article 10 of Chapter 15 (Title 22, CCR, §66265.190 through §66265.200, except §66265.197 (c)).

DTSC encourages annual integrity tests and utilization of secondary containment for treatment tanks. However, new emergency regulations, adopted June 16, 1995, delayed the deadlines for requirements for tanks that are not regulated under federal regulations, including most onsite treatment and recycling tanks.

For non-RCRA regulated tanks, January 1, 1998 is the new deadline for providing an integrity test. The new deadline for providing secondary containment is also January 1, 1998, which applies to new tanks as well. The secondary containment requirement may be permanently changed in the future. DTSC is studying alternative tank standards as part of the Regulatory Structure Update (RSU) process.

## CLOSURE:

You are not required to prepare and maintain a written closure plan. However, if you cease operating any treatment unit or process that was conditionally exempted, you must remove or decontaminate all hazardous waste, waste residues, containment system components, soils, and other structures or equipment contaminated with hazardous waste from the unit.

The removal of the unit from service must be conducted in a manner that minimizes the need for further maintenance and eliminates any potential for release or escape of hazardous waste into the environment.

If you permanently cease operation of the unit, you must notify DTSC and the local enforcement agency, or your local CUPA once they are certified, in writing that you have properly closed the unit pursuant to HSC §25201.5 (d)(8). This notification should also include the following information: company name and address, EPA ID number, tier of authorized unit(s), and date of closure. You will be assessed the fee for operating under CE each year until you notify your CUPA or DTSC if there is no local CUPA that you have closed the treatment unit as described above.

## LOCAL LAND USE/PUBLIC NOTICE:

For the purposes of local land use decisions, you cannot be designated by a local agency as a hazardous waste treatment facility because of this onsite treatment activity. You are also exempt from the requirement to publish a public notice regarding your treatment operation.

## INSPECTION PROGRAMS:

The law requires that you be inspected for compliance with the conditions of the CE tier within two years of your initial notification, and then every three years thereafter. This inspection will be conducted by the local CUPA or DTSC if there is no local CUPA.

## DISCLOSURE STATEMENT:

You are exempt from the requirement to provide a disclosure statement regarding past environmental violations, compliance orders, convictions or judgements, as describe in HSC §25200.4.

## UPCOMING CHANGES:

**Regulatory Structure Update (RSU)**

DTSC is conducting a review of the California regulatory requirements that go beyond the federal minimum standards. Many of these reviews will affect generators and onsite treaters. Topics include: review of waste classification differences, allowing extensions of the generator 90 day accumulation time, whether some onsite treatment activities are adequately regulated by other agencies, and handling wastestreams that are currently ineligible for onsite tiers (e.g., cyanides and other reactive or extremely hazardous wastes). Copies of all RSU scoping papers may be obtained electronically via Cal/EPA's Home Page on the Internet. The address is:
http://www.calepa.cahwnet.gov/dtsc.htm
Questions regarding RSU may be directed to Mary Anne Gottfried at (916) 323-9219.

## RECORDKEEPING:

In addition to any recordkeeping requirements contained in the generator standards discussed previously, as an onsite treatment facility, you must prepare and maintain the following records:

- Written operating instructions for each treatment unit operated under CESW.

- Records of the dates, amounts, and types of waste treated in each unit operated under conditional authorization. These records must be adequate to demonstrate to an inspector that you have notified DTSC under the correct tier.

- A written inspection schedule and a log of the inspections you conduct of each treatment unit.

- Records to show that you are in compliance with all applicable pretreatment standards and industrial waste discharge requirements issued by the Publicly Owned Treatment Works (POTW).

- These records must be maintained onsite for a period of three years.

## NEW TRAINING CLASS:

California Compliance School, started in January 1995 and is offering a new module on Tiered Permitting. The class covers the appropriate tiers for a treatment activity and operating within the requirements. Call Bakersfield College at 1-800-337-1422 for information on enrollment, class times, locations and costs. Training on the four generator modules is also continuing, with classes available for presentation at central locations or at your worksite.

## CONDITIONAL EXEMPTION-SPECIFIED WASTESTREAMS: WASTESTREAMS

**The following are the eligible wastestreams and treatment processes operating under CESW (HSC §25201.5(c) and HSC §25200.1.5):**

**1. Treating resins mixed or cured in accordance with the manufacturer's instructions (including one-part and pre-impregnated materials).**

**2. Treating containers of 110 gallons or less capacity that contained hazardous waste by rinsing or physical processes, such as crushing, shredding, grinding, or puncturing.**

**3. Drying special wastes, as classified by the department pursuant to Title 22, CCR, §66261.124, by pressing or by passive or heat-aided evaporation to remove water.**

**4. Magnetic separation or screening to remove components from special waste, as classified by DTSC pursuant to Title 22, CCR, §66261.124.**

*(**NOTE:** Treatment processes #5 & #6 no longer require authorization from the DTSC.)*

**5. NO AUTHORIZATION IS NEEDED to neutralize acidic or alkaline (base) wastes from the regeneration of ion exchange media used to demineralize water. (To be eligible for this exemption, this waste cannot contain more than 10 percent acid or base by weight.) (Effective January 1, 1995).**

**6. NO AUTHORIZATION IS NEEDED to neutralize acidic or alkaline (base) wastes from the food processing industry. (Effective January 1, 1996).**

**7. Recovery of silver from photofinishing. The volume limit for conditional exemption is 500 gallons per generator (at the same location) in any calendar month.**

*(**NOTE:** Silver recovery from photofinishing is completely exempt from authorization requirements if the quantity treated is 10 gallons or less in any calendar month. Do not notify DTSC if you qualify for this exemption. (Retain documentation verifying your eligibility for this exemption, such as developer invoices.))*

**8. Gravity separation of the following, including the use of flocculants and demulsifiers if:**
A. The settling of solids from the waste where the resulting aqueous/liquid stream is not hazardous.
B. The separation of oil/water mixtures and separation sludges, if the average oil recovered per month is less than 25 barrels (42 gallons per barrel).

*(**NOTE:** AB 483 (1995) allows certain used oil/water separation under the new CEL category. See CEL factsheet.)*

**9. Neutralizing acidic or alkaline (basic) material by a state certified laboratory or a laboratory operated by an educational institution, or a laboratory which treats less than one gallon of onsite generated hazardous waste in any single batch. (To be eligible for conditional exemption, this waste cannot contain more than 10 percent acid or base by weight.)**

**10. Hazardous waste treatment is carried out in quality control or quality assurance laboratory at a facility that is not an offsite hazardous waste facility.**

**11. A wastestream and treatment technology combination certified by DTSC pursuant to HSC §25200.1.5 as appropriate for authorization under CESW.**

**12. The treatment of formaldehyde or glutaraldehyde by a health care facility using a technology combination certified by DTSC pursuant to HSC §25200.1.5 (as authorized by CCR §67450.20).**

## RECENT LEGISLATION:

1. Senate Bill (SB) 1636 (1994) exempted the recovery of silver from photographic solutions from permit and notification requirements if the quantity treated is 10 gallons or less in any calendar month. These generators were previously required to operate under a grant of CE.

2. SB 657 (1994) exempted the neutralization of acids and alkaline (bases) wastes from the regeneration of ion exchange resins used to demineralize water from permit and notification requirements provided that the waste does not contain more than 10 percent acid or base by weight. These generators were previously required to operate under a grant of CE.

3. SB 657(1995) exempts the neutralization of acids and alkaline (base) wastes from the wastes from the food processing industry from permit and notification requirements. These generators were previously required to operate under a grant of CE.

If these exemptions apply to your company, please notify DTSC and the local enforcement agency (health officer or other designated public officer) in writing to withdraw your authorization.

4. Assembly Bill (AB) 483 (1995) adds a new category within the Conditional Exemption Tier, referred to by DTSC as Conditional Exemption Limited (CEL), with a one-time only $100.00 fee. This tier only applies to the operation of FTUs. It authorizes:

- Aerosol can treatment, when using DTSC certified equipment and recycling the crushed cans.
- Treatment of used oil using certain oil/water separators, hazardous only due to the oil, when the recovered oil is recycled using an authorized offsite facility. This category does not include contaminated groundwater and water contaminated with fuel (no more than two percent (2%) diesel fuel or any measurable amount of gasoline).
- Totally enclosed treatment units, but only after DTSC adopts regulations.

**For additional guidance, please read the Fact Sheet on Conditional Exemption Limited.**

5. SB 1135 (1995) eliminates some permit requirements for storing large volumes of liquid hazardous waste and increased generator accumulation time for generators of less than 1,000 kg/month under certain circumstances.

6. AB 1060 (1995) allows generators to hold non-RCRA contaminated soils from site cleanup projects in waste piles without obtaining a hazardous waste facility permit.

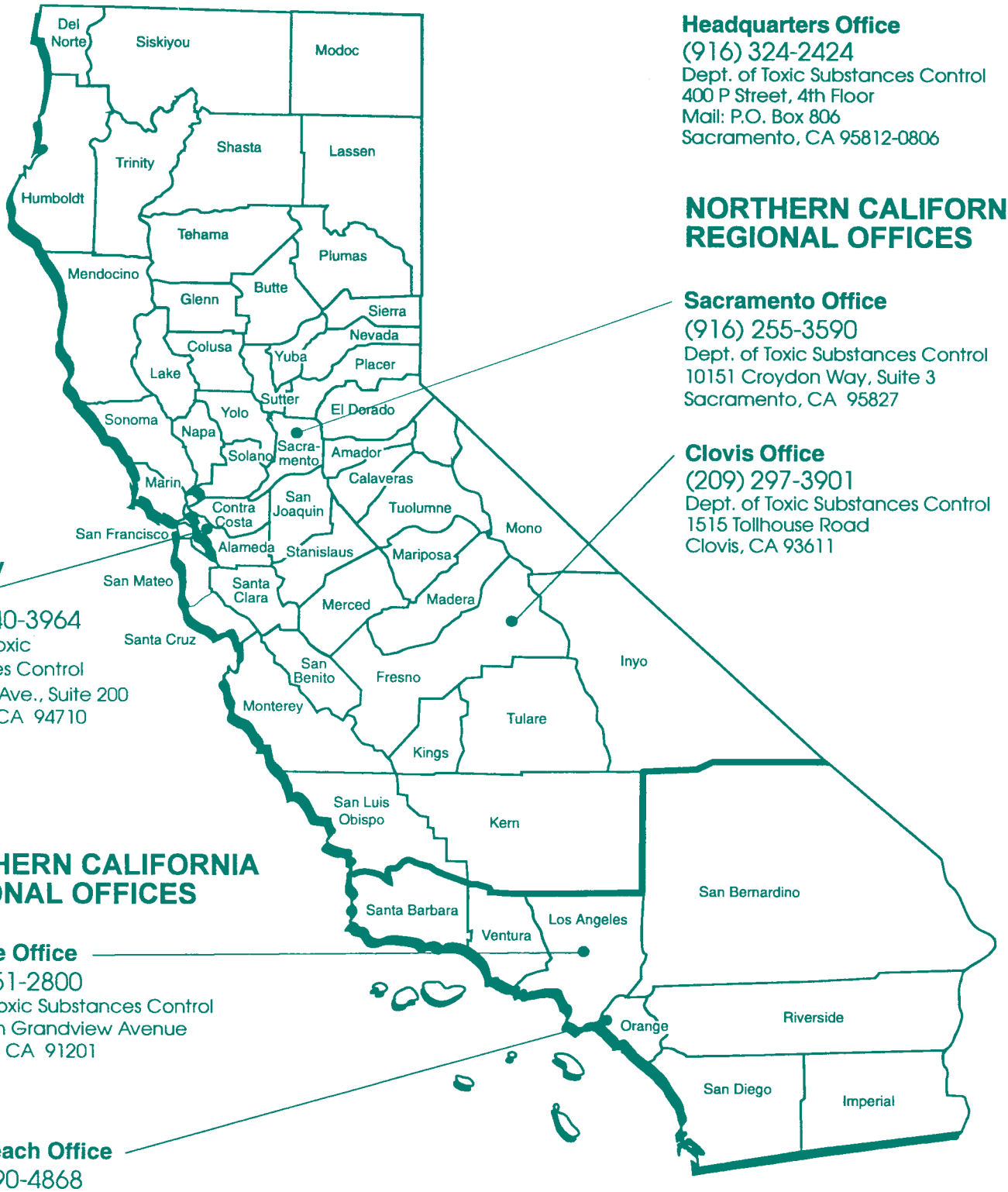
7. SB 1222 (1995) eliminates source reduction planning and reporting requirements for companies with less than 12,000 kg/year of hazardous waste.

8. SB 1291 (1995) makes the following changes:

- adds the curing of resins to CESW.
- allows DTSC to add new treatment to onsite tiers by regulation.
- changed the onsite treatment fee system so that companies will only pay a fee on the highest tier they operate. Previously, a separate fee was charged for each tier. The fees for many onsite treatment facilities will be reduced in 1996.
- generators operating under CA and CE are legally authorized 60 days after submitting a complete notification. SB 1291 allows DTSC to shorten the time period between notification and authorizationn when the owner or operator shows good cause.

## Tiered Permitting Telephone Contact Numbers

For further information, please call the nearest Office
Ask for "Tiered Permitting Assistance"




### Headquarters Office
(916) 324-2424
Dept. of Toxic Substances Control
400 P Street, 4th Floor
Mail: P.O. Box 806
Sacramento, CA 95812-0806

## NORTHERN CALIFORNIA REGIONAL OFFICES

### Sacramento Office
(916) 255-3590
Dept. of Toxic Substances Control
10151 Croydon Way, Suite 3
Sacramento, CA 95827

### Clovis Office
(209) 297-3901
Dept. of Toxic Substances Control
1515 Tollhouse Road
Clovis, CA 93611

### Berkeley Office
(510) 540-3964
Dept. of Toxic
Substances Control
700 Heinz Ave., Suite 200
Berkeley, CA 94710

## SOUTHERN CALIFORNIA REGIONAL OFFICES

### Glendale Office
(818) 551-2800
Dept. of Toxic Substances Control
1011 North Grandview Avenue
Glendale, CA 91201

### Long Beach Office
(310) 590-4868
Dept. of Toxic Substances Control
245 West Broadway, Suite 350
Long Beach, CA 90802

# ADDITIONAL PUBLICATIONS

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"American Society for Healthcare Environmental Services", Professional Development Products Catalog, "An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities", AHA Services, Inc., P.O. Box 92683, Chicago, Illinois 60675-2683, 1-800-AHA-2626, Fax (312) 280-6015

"Common Sense Pest Control", Olkowski and Darr, Taunton Publishers, Bio-Integral Resource Center (BIRC), (510) 524-2567

"Environmental News - Helping Hospitals Go Green", "Survey of Chemical Use in Colorado Hospitals", Colorado Hospitals for a Healthy Environment, 2140 South Holly Street, Denver, Colorado 80222-5607, (303) 758-1630, Fax (303) 758-0047

"Facility Pollution Prevention Guide", U.S. Environmental Protection Agency, 1992, EPA/600/R-92/088. (513) 569-7562

"General Medical and Surgical Hospitals - An Introduction to California's Hazardous Waste Regulations", Department of Toxic Substances Control, (916) 324-3614

"Guidebook for Hospital Waste Reduction Planning and Program Implementation", McRae & Shaner, American Society for Healthcare Environmental Services, American Hospital Association, 1996 (800) 242-2626.

"Hazardous Materials Pharmacy Fact Sheet", PRO-ACT at (800) 233-4356, or http://es.inel.gov/

"Healthcare Hazardous Materials Management - The Newsletter of the Center of Healthcare Environmental Management", 5200 Butler Pike, Plymouth Meeting, PA 191462-1298 (610) 825-6000, Fax (610) 834-1275 ("Occupational Exposure to Hazardous Drugs" - August 1995, "EPA's Green Lights Program" - December 1994)

"Laboratory Waste Management Guide", May 1997, Librarian, Local Hazardous Waste Management Program in King County, 130 Nickerson Street, Suite 100, Seattle, Washington, 98109, Phone (206) 689-3051, Fax (206) 689-3070, or anne.moser@metroke.gov

"Lighting Waste Disposal", U.S. Environmental Protection Agency Green Lights Program, January 1994. Contact a regional EPA office.

"Managing Your Medical Waste for a Healthier Bottom Line" - videotape - University of Louisville, Kentucky Pollution Prevention Center, Louisville, Kentucky 40292, (502) 852-0965

"New and Emerging Technologies for the Sterilization of Medical Devices, Emmanuel, Jorge, PhD., P.E., June 1996. Draft paper prepared for the EPRI Healthcare Initiative (718) 920-0849

"Pests of Landscape, Trees, and Shrubs," "Pests of the Garden and Small Farm", University of California Division of Agricultural and Natural Resources Publications, (510) 642-2431

"Pollution Prevention and Waste Minimization in Laboratories", Peter Reinhardt, et al., CRC/Lewis Publishers, Boca Raton, 1995.

"Pollution Prevention Tips: Water and Chemicals Reduction for Cooling Towers", May, 1987 North Carolina Department of Environment, Health, and Natural Resources, Pollution Prevention Program, P.O. Box 27687, Raleigh, North Carolina 27611-7687, (919) 733-7015

"Technical Support Document to Proposed Ethylene Oxide Control Measure for Sterilizers and Aerators", March 23, 1990, State of California Air Resources Board, Emissions Assessment Branch, 2020 L Street, Sacramento, CA 95814, (916) 322-6023

"The Practical Application of Disinfection and Sterilization in Health Care Facilities", Cokendolpher and Haukos, American Society for Healthcare Environmental Services and American Society for Healthcare Central Services Professionals, American Hospital Association, 1995. (800) 242-2626

## *FURTHER INFORMATION*

**For more information, contact:**

Department of Toxic Substances Control
Office of Pollution Prevention and Technology Development
P.O. Box 806
Sacramento, California 95812-0806
(916) 322-3670

For online access contact

Cal EPA:
http://www.calepa.cahwnet.gov/

DTSC:
http://www.calepa.cahwnet.gov/dtsc/dtsc.htm

OPPTD:
http://www.cwo.com/opptd/

**For information about your regulatory requirements, contact the Department's regional office nearest you:**

| | | |
|---|---|---|
| Region 1 - | Sacramento | (916) 255-3545 |
| | Fresno | (209) 297-3901 |
| Region 2 - | Emeryville | (510) 540-2122 |
| Region 3 - | Burbank | (818) 551-2800 |
| Region 4 - | Cypress | (714) 484-5300 |

**For information about waste exchanges, contact the:**

California Waste Exchange at (916) 322-4742, FAX (916) 327-4495
For online access contact http://www.calepa.cahwnet.gov/dtscdocs/cawastex.txt

California Materials Exchange at (800) 553-2962

**To get an EPA ID number, call:**

DTSC
Program and Administrative Support Division
(916) 255-1136 or (800) 618-6942

**To purchase a copy of the California Code of Regulations, call (415) 244-6611, or write:**

Barclays Law Publishers
P.O. Box 3066
South San Francisco, California 94083-3066
(There is a charge for the regulations)

**For information on registered haulers, contact:**

California Highway Patrol
Motor Carrier Safety Unit
1551 Benicia Road
Vallejo, California 94591
(707) 648-4180

California Highway Patrol
Motor Carrier Safety Unit
437 North Vermont Ave.
Los Angeles, California 90004
(213) 664-1108

California Highway Patrol
Motor Carrier Safety Unit
11336 Trade Center Drive
P.O. Box 640
Rancho Cordova, California 95741-0640
(916) 464-2090

**For general questions about small quantity generators or federal regulations, call:**

U.S. EPA, Small Business Ombudsman Clearinghouse Hotline
(800) 368-5888

U.S. EPA, RCRA (Resource Conservation and Recovery Act) Hotline
(800) 424-9346

U.S. EPA, Community Relations, Region IX, San Francisco, California
(800) 231-3075

U.S. EPA, RCRA Information Line, Region IX, San Francisco, California
(415) 744-2074