Dealing with Hazardous Materials

How do you know you've got hazardous materials?
How do you avoid them?
What are your responsibilities if you've got them?

Read Product Labels Carefully

SIGNAL WORD MEANINGS

DANGER. Highly toxic /severe irritation or damage

WARNING. Moderately toxic /irritating

CAUTION. Slightly toxic /irritating

Here is a label from Clorox, Chlorine bleach carries very strong health warnings because it is corrosive, especially in its concentrated form. The red arrow is pointing to the “signal” word, “Danger.” These signal words are part of the Safety Data Sheet (SDS). Note that there are three choices for the signal word:

Danger – highly toxic/severe irritation or damage,

Warning – moderately toxic/irritating, and

Caution – slightly toxic/irritating.

Read a Safety Data Sheet (SDS)

SDS Parts 1-3: Basic Chemical Details
Section 1: Identification
Section 2: Hazard Identification
Section 3: Composition/Information on Ingredients

SDS Parts 4-8: Recommended Actions
Section 4: First-Aid Measures
Section 5: Fire-Fighting Measures
Section 6: Accidental Release Measures
Section 7: Handling and Storage
Section 8: Exposure Controls/Personal Protection

SDS Parts 9-11: Technical Details
Section 9: Physical and Chemical Properties
Section 10: Stability and Reactivity
Section 11: Toxicological Information

SDS Parts 12-16: Specific Needs
Section 12: Ecological Information
Section 13: Disposal Considerations
Section 14: Transport Information
Section 15: Regulatory Information
Section 16: Other Information

We'll start by talking about how to identify hazardous materials.

One place to look is the Safety Data Sheet. These are required by OSHA and are included with all chemicals/products purchased. Most of the time now, they're online. They have requirements as to their content, but the format is not standard, therefore, it is often hard to find some of this information, but it should all be there.

- Parts 1-3: Basic Chemical Details
- Parts 4-8: Recommended Actions
- Parts 9-11: Technical Details
- Parts 12-16: Information for Specific needs

Section 3 -Composition/ Information on Ingredients

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No	Weight-%	Trade Secret
Sodium hypochlorite	7681-52-9	1-5	*
Lauramine oxide	1643-20-5	0.1 - 1	*
Sodium hydroxide	1310-73-2	0.1 - 1	*
Myristamine oxide	3332-27-2	0.1 - 1	*

*The exact percentage (concentration) of composition has been withheld as a trade secret

This is for Clorox Toilet Bowl Cleaner Bleach – all scents.
Section 3 includes the chemical name, its formula, formula weight, concentration, and Chemical Abstracts Service unique identifying number (CAS#). The CAS# is the single identifying number for each specific substance. CAS# should match the CAS# on the bottle label. You can look up a chemical by CAS number in the NIOSH pocket guide (https://www.cdc.gov/niosh/npg/default.html) to get general industrial hygiene information about that specific chemical.

Note that a manufacturer can limit your knowledge about the exact percentage of chemicals in the mixture because it's a trade secret. However, OSHA rules allow for this information to be made available to you if you have a legitimate need.

See sections 4-8 for information about handling the material and what to do in the event of an exposure situation.

4: First-Aid Measures
5: Fire-Fighting Measures
6: Accidental Release Measures
7: Handling and Storage
8: Exposure controls and Personal Protection

These sections tall you what to do if a hazardous situation occurs. **First-aid** measures are only meant for immediate first aid and should always be followed up with professional medical care.
The **fire-fighting** measures are written for fire fighters. Some chemicals become much more dangerous in fire circumstances, such as reacting when exposed to water. The Flash point (the lowest temperature at which enough vapor is present to form an ignitable mixture with air); Upper and lower flammable limits; and the autoignition temperature (AIT) are common properties included in this section.
The **Handling and Storage** section help you know how and where to store chemicals to prevent a hazardous situation from occurring.
The **Exposure controls and Personal Protection** section tell you what PPE to wear and the OSHA exposure limits.

Sections 9-11 describe the physical properties and toxicological information.

9: Physical and Chemical Properties
10: Stability and Reactivity
11: Toxicological Information

Physical and Chemical Properties section provides clear, concise, and useful physical and chemical properties help you learn more about the chemicals you use. The first part describes the material's appearance. If it doesn't look like this, STOP. Do not use it. It may be more or less hazardous. This section also contains the pH of the product.

Stability and Reactivity section describes the conditions or reactions to be avoided. Also provides some indication about anticipated shelf life.

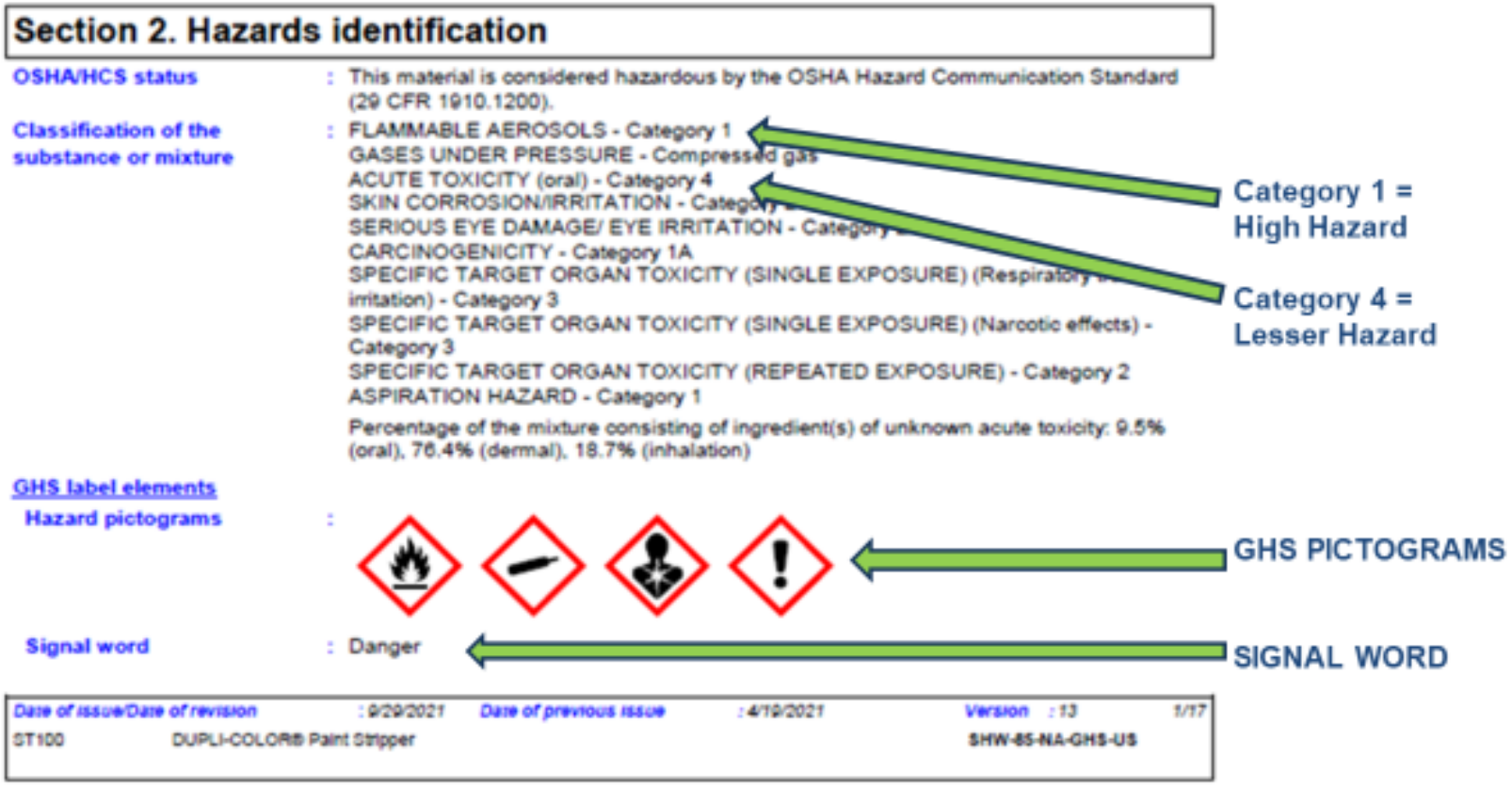
The **Toxicological Information** section provides medically-oriented detail on how the material may harm you, ranging from routes of exposure to toxic symptoms and including any known acute (short exposure) and chronic (long term) effects along with their target organs. Oral (ORL), inhalation (IHL), and skin absorption (SKN) toxicity data on test animals is included.

Sections 12-16 provide information about the risk to the environment, disposal, and transportation, plus other pertinent information.

12: Ecological Information
13: Disposal Considerations
14: Transport Information
15: Regulatory Information
16: Other Information

- **Ecological** Information section provides information on the ecological impact of the chemical if a spill enters a river or lake. For example, mercury is toxic to humans but will also build up in aquatic ecosystems, posing a serious hazard for fish and other aquatic wildlife. These concerns are regulated by EPA, not OSHA.
- **Disposal** Considerations section provides suggested disposal considerations of wastes and waste residues and contaminated packaging.
- **Transport** Information section refers to Department of Transportation shipping information.
- **Regulatory** information is a catch-all section for applicable information as to which EPA regulations apply for this chemical.
- **Other** information section provides additional, non-regulatory information. This often includes information about the SDS itself, such as date created and abbreviations used in the document.

Section 2 – Hazards Identification



Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE AEROSOLS - Category 1
GASES UNDER PRESSURE - Compressed gas
ACUTE TOXICITY (oral) - Category 4
SKIN CORROSION/IRRITATION - Category
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category
CARCINOGENICITY - Category 1A
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory irritation) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) - Category 2
ASPIRATION HAZARD - Category 1
Percentage of the mixture consisting of ingredient(s) of unknown acute toxicity: 9.5% (oral), 76.4% (dermal), 18.7% (inhalation)

Category 1 = High Hazard

Category 4 = Lesser Hazard

GHS label elements

Hazard pictograms :

GHS PICTOGRAMS

Signal word : Danger

SIGNAL WORD

Date of issue/Date of revision : 9/29/2021 Date of previous issue : 4/19/2021 Version : 13 1/17
ST100 DUPLI-COLOR® Paint Stripper SHW-85-NA-GHS-US

Section 2 of the SDS is the most important section for our purposes – it provides an overview of the physical and health hazard risks associated with the material. This is section 2 from a paint stripper.

The first category, “status” merely confirms that this chemical is required to have an SDS.
The second category, “Classification of the substance or mixture” shows all the hazardous classifications using the GHS - Globally Harmonized System of Classification and Labelling of Chemicals. In this case, flammable, gas under pressure, acute toxicity (oral), skin corrosive/irritant, eye irritant, carcinogen, organ toxicity, and aspiration.

Hazard pictograms call attention to physical and health hazards.
Flame – used for flammables, pyrophorics, self-heating, emits flammable gas, self-reactive, organic peroxides
Gas Cylinder – used for gases under pressure
Health Hazard – used for carcinogen, mutagenicity, reproductive toxicity, respiratory sensitizer, target organ toxicity, aspiration toxicity
Exclamation Mark – Irritant (skin and eye), skin sensitizer, acute toxicity, narcotic effects, respiratory tract irritant, hazardous to ozone layer (non-mandatory)

The signal word is Danger. It can be Danger, Warning, or Caution. Danger is more severe than warning, which is more severe than caution.

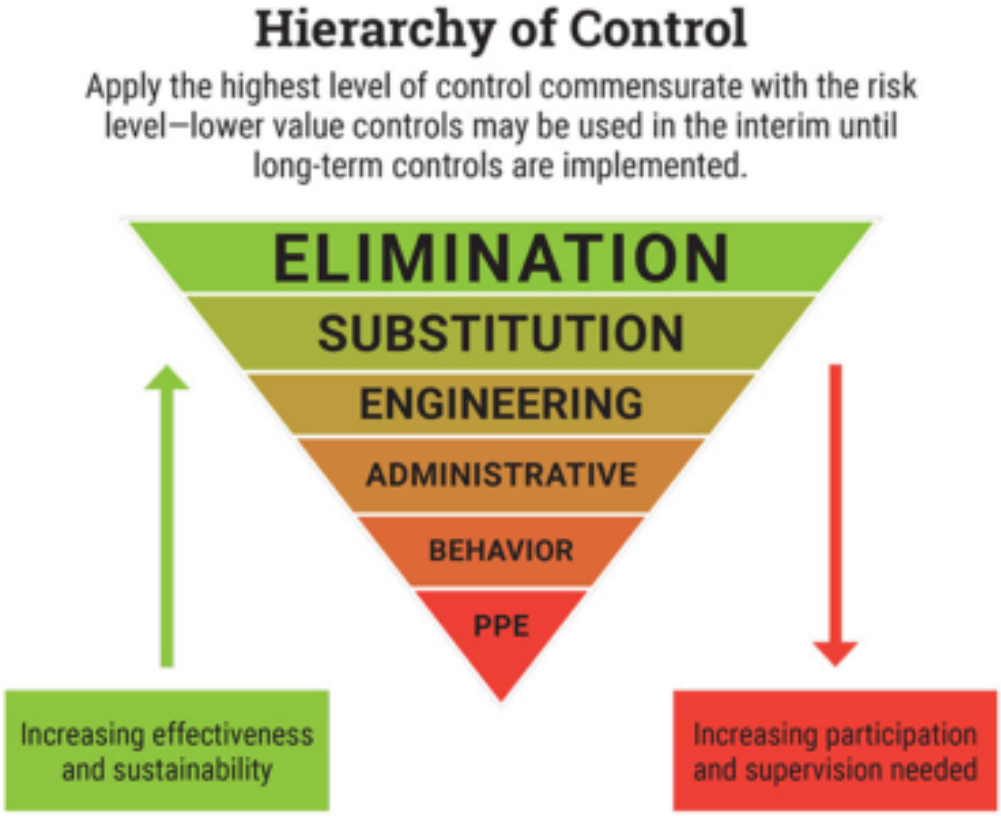
Question

Of the signal words on product labels and SDSs, what is the correct order from most hazardous to least hazardous?

a) Caution, danger, warning
b) Warning, danger, caution
c) Danger, warning, caution
d) Danger, caution, warning

Here is the first question that will be on your quiz at the end of the day.
Answer is C – Danger, warning, caution

Responsibilities and Safe Handling of Hazardous Materials

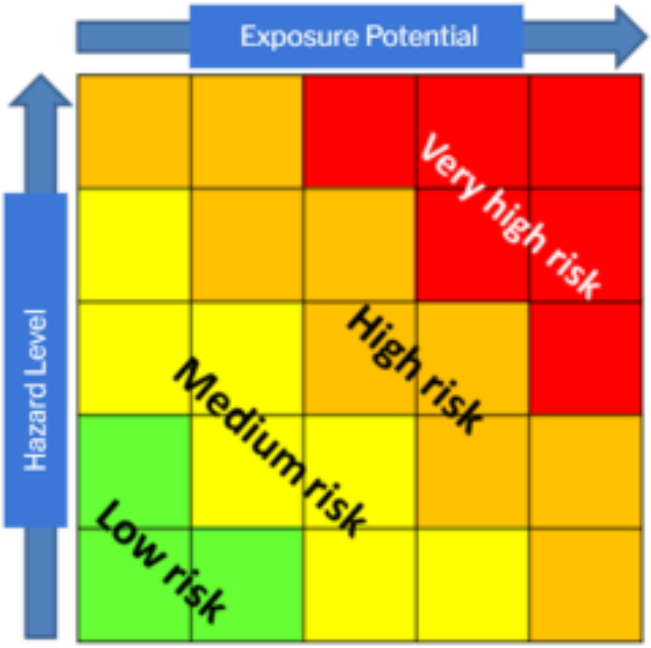


Once you've identified the hazardous materials you have within operations, what are your responsibilities for handling and storing them? What hazardous materials can you eliminate? The first and best option is to eliminate those materials. Next would be to substitute a less-hazardous material for the current hazardous material. Then, you could implement engineering controls, which will protect people without them having to do anything... Engineering controls include things like fully enclosed mixing equipment to mix cleaning chemicals so workers aren't exposed to concentrated solutions, another example is ventilation in the work booth – to remove solvent or paint fumes.

The next option is administrative control. Administrative controls include policies that protect workers from exposure or training and education to teach workers how to handle the chemicals. The fifth most desirable action is changing behavior. This would include getting people to actually change the way the perform operations. After being educated and trained, they need to act on this information. Some organizations have developed excellent cultures of safety, which include administrative controls and behavior changes. However, people are people and without a strong understanding of the risks of materials they work with and a supportive culture of safety, people may still cut corners. The least desirable option is using personal protective equipment (PPE). PPE can include gloves, safety glasses, helmets, facemasks, etc. The problem with PPE is that people don't always wear it and sometimes people feel totally protected when they do wear it but there are still risks, especially if the PPE is defective in any way.

You can see that the top of the pyramid is best for efficiency and sustainability and as you move down the pyramid, increased participation and supervision is needed.

Human Health as a Priority: Assessing Risk



Risk = Hazard + Exposure

This chart is showing the risk to humans but it also represents environmental risk. on the left-hand (Y) axis you see that the hazard level of the material increases from very low at the bottom to very high at the top. Along the X axis you see that the exposure potential goes from minimal on the left to high on the right. If you have a material with a low hazard value and low exposure potential, the risk is low. However, if the chemical has a high hazard value and high exposure potential, the risk is high. The hazard may be cancer-causing, or asthma inducing, or impart on other health or physical hazards. This chart demonstrates the concept of "Dose Makes the Poison" - showing it's not only the hazard of the chemical or product that counts, but the risk is also dependent on how much exposure and often the route of exposure.

This chart emphasizes the importance of reducing risk by reducing or eliminating the hazard in the material (substituting the materials for a safer alternative) and the importance of protecting from exposure when hazardous materials are required to be used. Remember that there are multiple paths of exposure, though, so it's far better to avoid the risk by changing the chemical if possible.

Eliminate by using Pollution Prevention (P2) techniques

P2 = Actions or Best Practices that eliminate, prevent, or reduce pollution at its source before pollution and waste are created.

- Change the Material
- Change the Process
- Change the Equipment

Pollution prevention includes actions or best practices that eliminate, prevent, or reduce pollution at its source. An example is found when using solvents to clean automotive parts. Instead of using a solvent that contains toxics, an aqueous detergent and automatic parts washer may be used. You're changing the material (solvent to aqueous cleaner) and changed the process and equipment - from a solvent sink to an automatic washer.

One or more of these actions can help move towards a lower environmental footprint.

C**hange the Material** – switch to a safer cleaner or low VOC paint, for example. When you get lucky, you can just buy a different material and keep the existing process the same. For example, when painting interior spaces, a lower VOC paint can be used without changing how the painting is done.

Of course, that doesn't always work... Changing the material includes substituting a less hazardous material for what is currently being used. An example is to change from a cleaning product containing solvent to one without solvent. If the soils being cleaned are greasy, solvent helps remove them. Changing to a cleaning product without solvent may require that some additional wiping or scrubbing occur – so it may require a change in the process. Another way to change the material is to use less of the chemical currently being used. This is often an option because (a) manufacturer's recommended chemical concentrations for a "typical" situation may be more than you need or (b) workers may think "more is better" and use higher concentrations than are necessary.

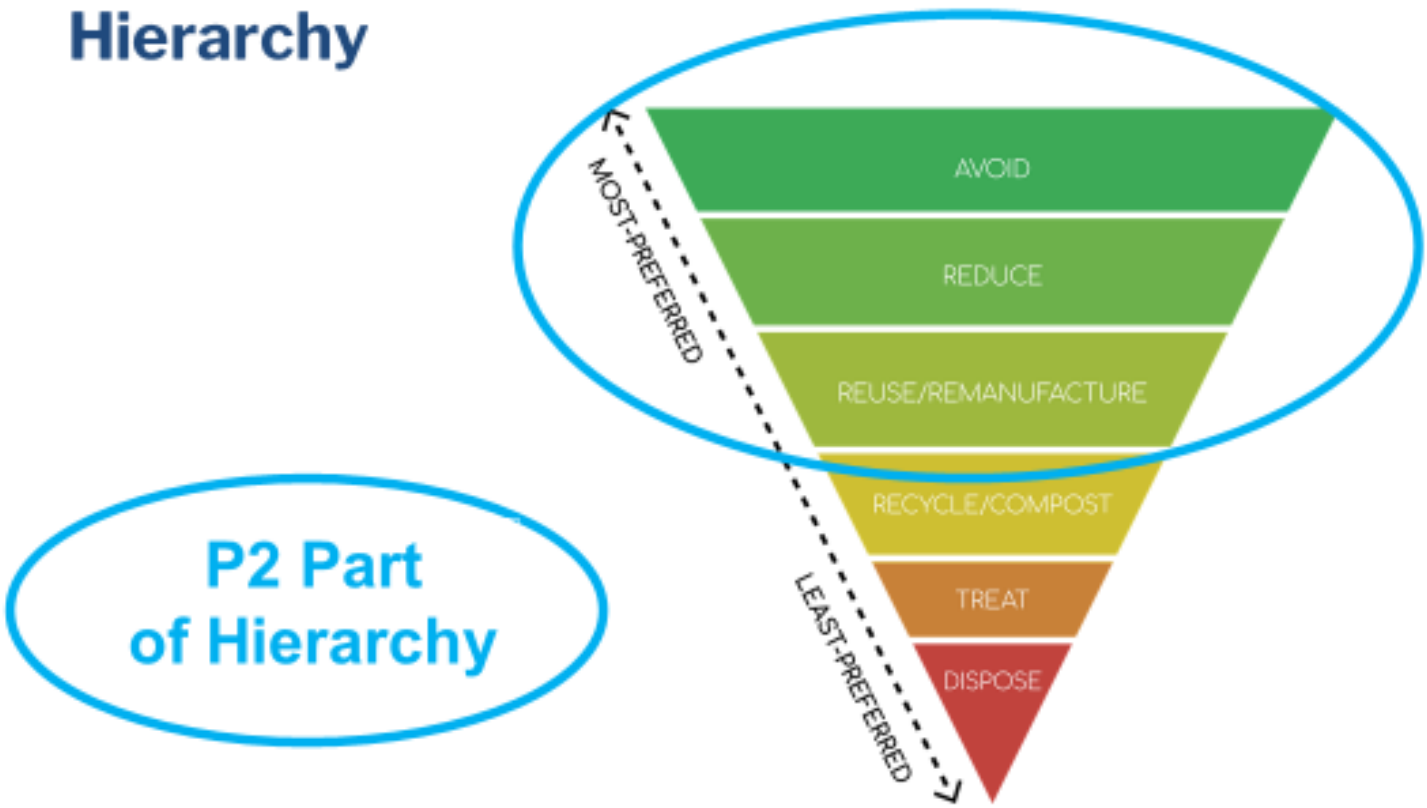
Change the Process – an example would be to add a mechanical cleaning process prior to chemical cleaning.

Although it's harder to think about, in some cases, when you identify what the soil is that you're trying to remove, you may discover that you can change something upstream and eliminate the need for some pollutant down stream. A classic example is switching from an oil-based to aqueous-based cutting fluid, which then allows you to use an aqueous cleaner instead of a traditional solvent cleaner downstream. Other examples of changing the process include switching to an aqueous cleaner in an ultrasonic cleaning bath or switching to an automatic parts washer (like a dishwasher) instead of a solvent sink. Many times, when using a less-aggressive cleaner, mechanical cleaning needs to be done along with it. So, it's both a chemical and process change.

Change the Equipment – an example is switching from a solvent parts washer to an aqueous based parts washer that may take longer but is automated. Ultrasonic parts washers achieve mechanical cleaning by using high frequency sound waves transmitted through a liquid to scrub clean the surface of immersed parts.

What is Pollution Prevention (P2)?

Hierarchy



This diagram is known as the Pollution Prevention and/or Waste Management Hierarchy. It depicts the higher priority of avoiding pollution and wastes as the most important actions. Avoid (on the P2 hierarchy) and Eliminate (on the handling of hazardous materials hierarchy) are the same. Avoid is like “Rethink/redesign”, the most preferred option on the Zero Waste hierarchy. The first and preferred option is to not deal with a hazardous material. Then you don’t have the exposure to people or the environment.

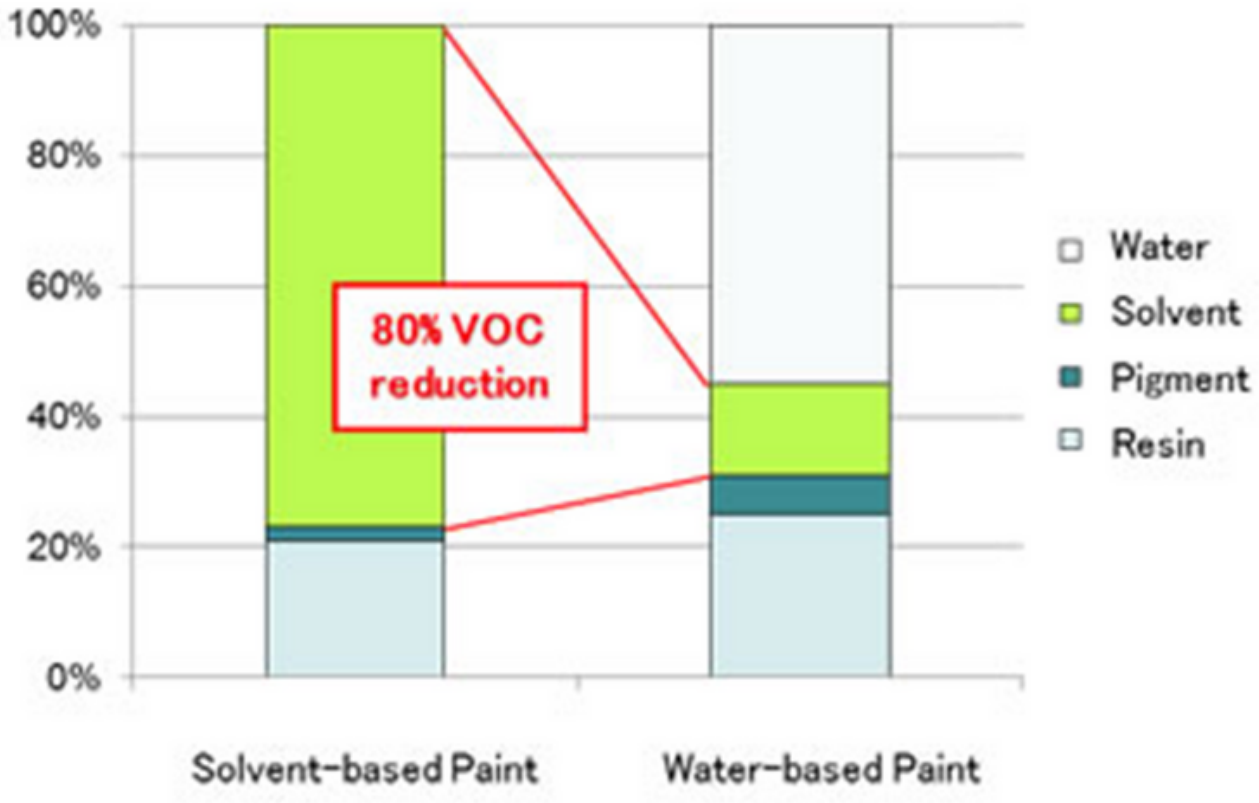
Next preferred option is reduce. This corresponds with Substitution on the Hazardous Materials hierarchy and Reduce on the Zero Waste hierarchy.
By reducing the use and production of hazardous substances, and by utilizing materials more efficiently, we protect human health, strengthen our economic well-being, and preserve the environment.

Next is reuse/remanufacturing. This is when a product doesn’t actually become a waste but is remanufactured or reworked before it becomes a waste, or it is reused or repurposed before it becomes a waste. This level corresponds to the Reuse option on the Zero Waste Hierarchy.

Then, the remaining tiers in pollution prevention waste management hierarchy are recycling & composting, treatment, and disposal. These are all strategies to deal with waste that is created, but pollution prevention actually only refers to the three top tiers: avoid, reduce, reuse/remanufacture.

Avoid (Eliminate)

- Replace hazardous materials with safer alternatives



At the top of the P2 hierarchy is Avoid. For the Hazardous Materials management hierarchy, it's Eliminate. This is just like it sounds - Eliminate a hazardous material or product or a polluting process. Replace hazardous materials with safer alternatives.

This image illustrates that when you use a water-based paint, you can get an 80% reduction in volatile organic compounds, VOCs. Exposure to VOC vapors can cause a variety of health effects, including **eye, nose, and throat irritation; headaches and loss of coordination; nausea; and damage to the liver, kidneys, or central nervous system**. Some VOCs are suspected or proven carcinogens. VOCs also contribute to ground-level ozone, or smog. In the case of paint, when you switch to a water-based coating, you don't need solvents to clean brushes, so that's a further avoidance or elimination of a hazardous material from your process.

Reduce (Substitute)

Use less chemical, less toxic chemical, and lower concentrations of chemicals when possible

Second on the P2 hierarchy is Reduce - the corresponding term on the hazardous materials management hierarchy is substitute and on the Zero Waste hierarchy it's also Reduce.

The module following this one is all about "green" purchasing - how you can easily identify and purchase materials that are less hazardous. In the case of green purchasing, you're substituting a less-hazardous or safer material for what you're currently using.

Another example is using less chemicals or lower concentrations as long as it still gets the job done. Are you buying concentrated chemicals? Do you need to use them at full strength? Sometimes you do, but it depends on the situation. Also, many people still subscribe to the mantra, "more is better." but that is not necessarily true. Perhaps you can get by with half-strength cleaners if you use microfiber cloths for cleaning or if you add mechanical action (scrubbing) to the cleaning. Or, there may be some cases when you need full strength, but under what conditions? When people are set on using certain products that contain hazardous materials, see if you can get them to reduce their usage, such as only using them for specific, limited operations.

Reuse/Remanufacture (P2 solution)

- Maintenance and auto repair shops send spent anti-freeze and used oil to refiner; purchase re-refined and reused

- Salvage materials from construction/demolition for use in new construction

One difference between reuse and recycling is that when a material is reused, it typically doesn't get broken down to the elemental level, it may be cleaned or filtered but is largely reused as it was. For example, used anti-freeze may be filtered so it can be used again but the plastic bottle it comes in would be recycled - ground up and reprocessed into something new. Some facilities have filtration or even distillation built into their process. Another example of re-use is using materials from demolition operations in new construction or remodel.

Prevent Spills and Leaks

- Easy to pour
- Tightly closed
- Good housekeeping
- Maintain equipment
- Recapture spills

Regardless of whether you're using hazardous materials or not, you don't want to waste materials you've paid for by having spills and leaks. You especially don't want exposure to hazardous materials due to mixing, transfer, or storage. Here are some best practices.

- Use containers that are easy to pour – don't have containers that are too big to lift for pouring or that have spouts that drip. Funnels are available in all sizes to aid in pouring.
- Keep containers tightly closed – if a tightly closed container is knocked over, it won't spill.
- Good housekeeping lets you move around in a storage area so chemicals can be accessed. It also allows you to notice if a leak has developed. Keeping the materials organized also helps you prevent overbuying which can result in some materials being trashed because they're out of date.
- Maintain and inspect equipment – look for damaged or rusted containers and leaks.
- Recapture spilled materials if possible with a dust pan and squeegee. Remember that any clean-up materials may need to be disposed as hazardous waste if the material being cleaned is hazardous.
- Store materials inside or under cover to prevent any spill or leak from being washed away into the stream by rainwater.
- Never use storm drains or gutters, ditches, or swales for waste disposal. This is essentially putting the chemical directly into the stream.

What to Do in Case of Emergency or Discharge

- Stop the spill
- Warn others
- Turn off ignition sources
- Contain the spill
- Report the spill
  - Call 1-800-OILS-911 in Washington state
  - Call 1-800-424-8802 for National Response Center

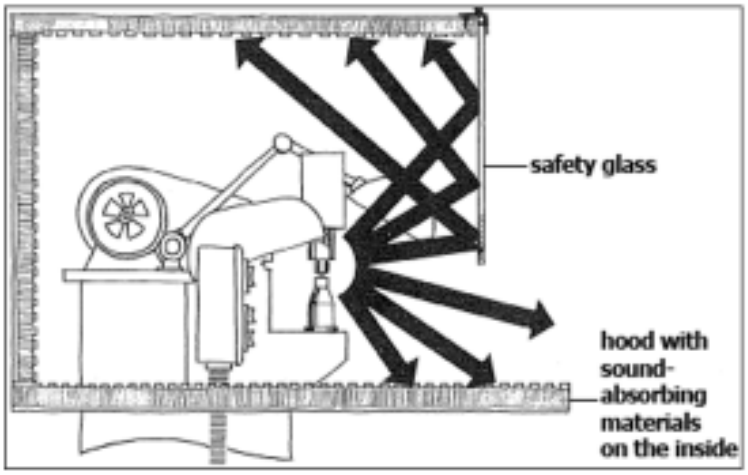
If you see a spill, report it by calling 1-800-OILS-911 (Washington Emergency Management Division, 24/7). During regular business hours, you can call the appropriate Ecology regional office.

Stop the spill and warn others in the area immediately. Contain the spill with sand or absorbent materials.
Shut off any ignition sources, including cigarettes.
Contain the spill.
Report the spill immediately to BOTH:
1-800-258-5990 (Washington Emergency Management Division)
1-800-424-8802 (National Response Center)
There are no penalties for reporting a spill unnecessarily, but there may be significant penalties for not reporting one.

Engineering Controls

Protect workers by removing hazardous conditions or placing a barrier around them

- **Automatic mixing equipment**
- **Ventilation**
- **Equipment modification**
- **Others**



Engineering controls focus on machinery, tools, equipment, and workplace design to reduce chemical exposure. Their advantage is that they do not rely on worker behavior. They can not only lead to a safer environment for workers but they can save the company money by controlling these processes. For example, using automatic mixing equipment prevents exposure of the employees to the hazardous material and assures that the right amount of chemicals are mixed together.

Administrative Controls

Requires worker or employer to do something

Typically, administrative controls do not eliminate the hazard and they rely on human behavior to be implemented. Best management practices are administrative controls.

Examples include:

- Written proper operating procedures, work permits and safe work practices
- Inspection and maintenance
- Housekeeping
- Monitoring the use of highly hazardous materials
- Supervision
- Training
- Alarms, signs and warnings
- Regulated areas
- Limit exposure by time or distance

Personal Protective Equipment

Requires worker to wear something

The last line of defense to protect workers and the environment when the use of hazardous material cannot be eliminated is personal protective equipment. It is worth noting that USEPA is now re-evaluating the health risk to workers posed by hazardous material use because PPE is not worn correctly or consistently, so the original risk evaluations must be revisited.

Responsibilities and Safe Handling of Hazardous Wastes

If you do end up needing to use hazardous materials, you must properly label, store, package, mark and ship them for proper disposal.

Preparing dangerous waste for transport.

- The generator must fulfill the following requirements before transporting off-site or offering for off-site transport any dangerous waste.
- (1) Packaging. The generator must package all dangerous waste for transport in accordance with United States DOT regulations on packaging, 49 C.F.R. Parts 173, 178, and 179.
- (2) Labeling. The generator must label each package in accordance with United States DOT regulations, 49 C.F.R. Part 172.
- (3) Marking. The generator must:
- (a) Mark each package of dangerous waste in accordance with the applicable United States DOT regulations on hazardous materials under 49 C.F.R. Part 172; and
- (b) Mark each container of one hundred nineteen gallons or less of dangerous waste used in such transportation with the following, or equivalent words and information in accordance with 49 C.F.R. 172.304:
- HAZARDOUS WASTE – State and federal law prohibits improper disposal. If found, contact the nearest police or public safety authority, and the Washington state department of ecology or the United States Environmental Protection Agency.

Responsibilities and Safe Handling of Hazardous Wastes

Hazardous Waste and Toxics Reduction Program

DEPARTMENT OF ECOLOGY
State of Washington

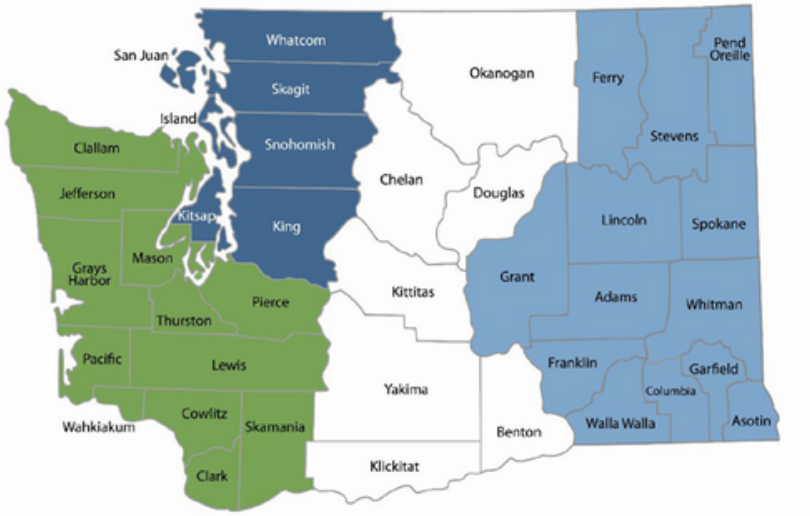
Guide to Dangerous Waste by Generator Category

Questions?

To speak to a dangerous waste specialist, contact your regional Ecology office.

Department of Ecology Regional Offices

Map of counties served



Northwest Regional Office, Shoreline: 206-594-0000
Counties: Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom

Southwest Regional Office, Lacey: 360-407-6300
Counties: Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum

Central Regional Office, Union Gap: 509-575-2490
Counties: Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima

Eastern Regional Office, Spokane: 509-329-3400
Counties: Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman

There are Federal guidelines and the states or Tribes can be more restrictive. Washington is more restrictive. Tribes can seek assistance from the state environmental regulatory agency or the USEPA.

Prioritizing – what to do first?

What does your policy say?

Businesses, Tribes, Communities, = may all have differing priorities for reduction of chemicals, wastes, costs, etc. priorities are different for each tribe or community or business and here's just a couple of examples that might bubble up as your priorities –

- protecting human health
- protecting water quality, protecting or improving air quality, protecting wildlife & marine life and their habitat
- reducing carbon footprint
- reducing waste generation
- Cutting costs

Stakeholders Collectively Rank Priorities

Here is a hypothetical outcome following a consensus-based exercise where a group determines their highest priorities.

- it may be a vote it may be a ranking system or a survey.
- In this case protecting human health bubbled to the top, followed by protecting wildlife and habitat.

Prioritize - susceptible populations

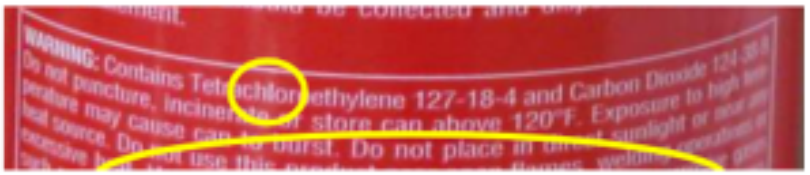
Previously we talked about the level of hazard in the chemical plus the level of exposure as combining to explain the level of risk. Now think about vulnerable populations - workers, residents, and guests. Think about workers who are chronically exposed to chemicals, such as a maintenance or auto repair tech working with solvents all day, or a landscaper who frequently sprays pesticides and fertilizers.

Other susceptible populations are those persons that are immune-compromised (diabetes, asthma, those undergoing chemotherapy, etc.), and the young and old. Exposure is especially critical for children whose brains, organs, and bodies are still developing. They intake more chemical per pound of body weight than adults.

Prioritize Chemicals

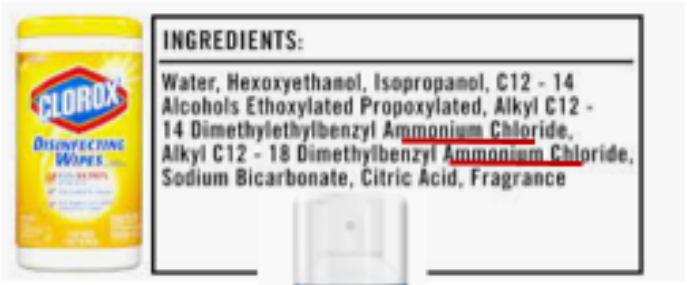
Chlorinated solvents *(Look for "**chlor**" in an ingredient name)*

Methylene **chlor**ide
Tetra**chlor**ethylene



Quaternary "quat" disinfectants
*(Look for "**ium chloride**" in ingredient names)*

Benzlkon**ium chloride**
Dimethyl benzyl ammon**ium chloride**



Forever chemicals (PFAS)
*(Look for "**fluor**" in ingredient names)*

Ingredient	C.A.S. No.
Water	7732-18-5
Fluorochemical Urethane	Trade Secret

Labels on some products may or may not list all ingredients. If labels give inadequate info, refer back to the SDS – Section 3. Here are a few specific ingredient names to look for and avoid.

Chlorinated solvents, which might be used in bulk or aerosols in fleets and home auto repair, are more toxic than non-chlorinated. Look for "chlor" in ingredient(s) names. Note that you may see "chlor" in bleach-type products and quats (the next product down), but we especially want to avoid chlor in solvent products.

Quats are asthmagens - and can be recognized with "ium chloride" in ingredient names.

PFAS/Forever chemicals – These are persistent in the environment, and many have very high global warming potential (e.g., hundreds of times higher than CO2). Look for "fluor" or "Teflon." This is the ingredient list for the Scotchgard product. It is difficult to identify all the PFAS chemicals.

Prioritize Low/No VOCs

- High VOC: strong smelling, fragrances
- Low VOC paints (<150 mg/L); look for 10% or less VOC

VOCs – respiratory issues, but also contribute to smog and are difficult for asthmatics

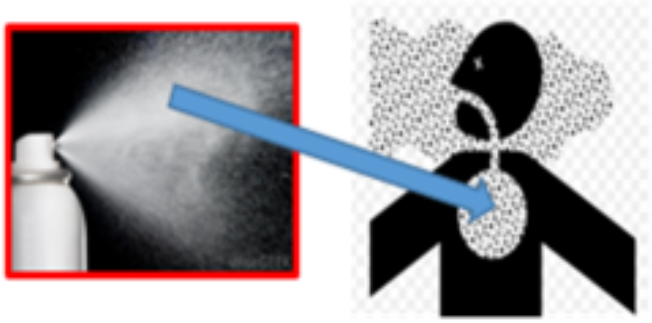
- Avoid strong smelling products
- Low VOC paints (<150 mg/L)
- Fragrances
- Solvents: Go Aqueous! If no aqueous alternative, buy low VOC (California Air Resources Board recommends ~10% by weight or lower)

- Volatiles or volatile organic compounds – VOCs - - try to avoid. They cause smog and are asthmagens.
- If smell is strong, it's likely volatile.
- Section 9 of the SDS shows percent volatility (aka VOC). Most SDS list the VOC or volatile content. Remember, though, that VOCs are, by EPA's definition, chemicals that are photochemically reactive and will contribute to ground-level ozone (smog). Some products may have volatile components that will be irritants but are not technically VOCs. Acetone is an example of a volatile product that is an exempt VOC.

Prioritize No Aerosols, PVCs

Aerosols

- Fine particulate/aerosolized droplets penetrate deep into lungs (Many are also high VOC)



Polyvinyl chloride (PVC)

- PVC shower curtains, kid toys

Aerosols - for example - Hair spray, disinfectants, air fresheners, engine degreasers/brake cleaners, lubricants (WD-40), Many Aerosols often contain VOCs. Aerosols create fine particles in aerosols are small enough that they can penetrate deeper into the lungs, especially compared to a trigger or pump spray bottle. Even spray pumps can send out fairly small particles/mists. A few ways to address aerosols are to purchase non-aerosol alternatives and to spray products directly into a cleaning cloth before use.

As for fragrances, these are often VOCs, and lung and nasal irritants to many. An easy thing to prioritize here is to purchase fragrance-free products, both for personal care products, and for cleaning. A single fragrance often contains 10 to 30 ingredients, including phthalates which are hormone disruptors.

PVC is known to contain phthalates and sometimes lead as a stabilizer. Look for PVC on product labels for pliable plastic items such as shower curtains and kid toys. PVC does have a characteristic smell, especially when you first take it out of a package. A good alternative for shower curtain is EVA (ethyl vinyl acetate).

Prioritize No Prop 65 Products

- Label or SDS with **Prop 65** Warning

Prop. 65 Warning for California Residents

WARNING: This product may contain chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

- Label or SDS with **Danger** or Category 1 or 2 Hazards

Prop 65 – a list of about 900 individual chemicals - known to cause cancer, developmental or birth defects, or reproductive harm, must display this on the label. It's a California law but affects the entire country (and beyond), because any product that COULD sell in state of California must be labelled.
Avoid products with the signal word Danger. Try to avoid those with warning.
In section 2 of the SDS, the "Classification of the substance or mixture" shows all the hazardous classifications using the GHS - Globally Harmonized System of Classification and Labelling of Chemicals. The individual hazards identified (such as flammable aerosol, acute toxicity, carcinogenicity, are also given a category designation. It is usually a number (1-4) or it could be a letter (A, B, C). 1 indicates a greater hazard category than 2 and A is greater than B. Some categories have sub-categories. 1A is a greater hazard category than 1B, for example. When prioritizing, try to avoid products with hazard category 1 or 2.

How does California claim to KNOW the chemicals that should be on the prop 65 list? It includes chemicals

- Identified by the World Health Organization's International Agency for Research on Cancar (IARC) as causing cancer in humans or laboratory animals,
- Chemicals identified by California's "State Qualified Experts" – the Carcinogen Identification Committee and the Developmental and Reproductive Toxicant Identification Committee
- Or by their designated agencies, and
- Chemicals that are required by the federal government to be labeled as causing cancer or birth defects or other reproductive harm.

Question

If a product has a Prop 65 warning on the label, what does it tell you about the product?

a) It is highly flammable.

b) It contains an ingredient that can cause damage to the ozone layer.

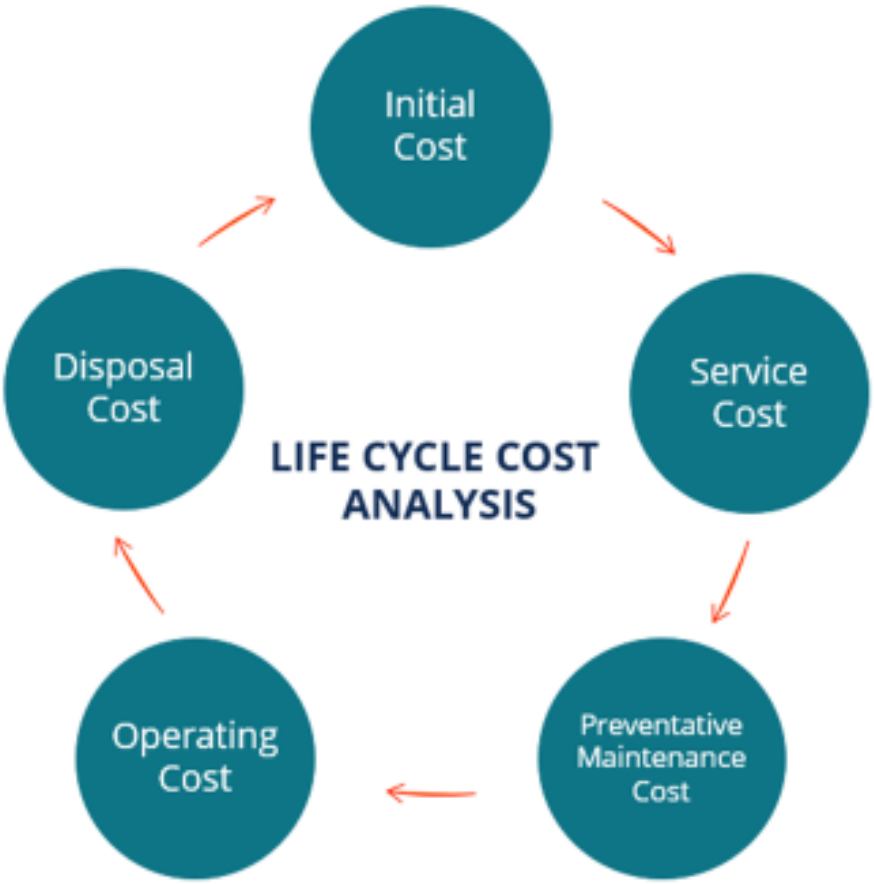
c) It contains a chemical that can cause cancer, and/or birth defects, and/or reproductive harm.

d) The product or ingredient is persistent in the environment.

e) It contains an ingredient that can cause asthma.

C – it contains a chemical that is known to cause cancer, birth defects, and/or reproductive harm.

Prioritize Lower Total Costs



Costs are always a consideration an may be a priority in some organizations. Remember – consider more than just the initial purchase price! There is the initial cost, the cost of service and maintenance, the operating costs (energy and supplies), and the disposal cost (which includes management of paperwork). Understanding the life cycle cost can help prioritize efforts for using safer products and reducing overall life-cycle costs.

Purchase through disposal – often a lot of costs we just don't think about, associated with the product. Consider the following:

- Using more product than needed for the job
- Storage space and labor to manage inventory
- Labor to manage hazardous materials and resulting wastes
- Personal Protective Equipment (PPE) (if hazardous material)
- Disposal fees: Solid and hazardous waste, including packaging, empty canisters/bottles, PPE, etc.
- Wastewater pretreatment/management plus labor

Examples

- Inefficient use of products costs more money
- Hazardous waste management aspects, including time and labor to manage and report,
- Disposal costs
- Required PPE and secondary containment costs
- Cost of any wastewater pretreatment chemicals, processes, and labor

Prioritize Protecting Habitat/Wildlife

(Food Service)

Greasy cooking water

Soapy car wash water

(DIY Car Maintenance)

Antifreeze

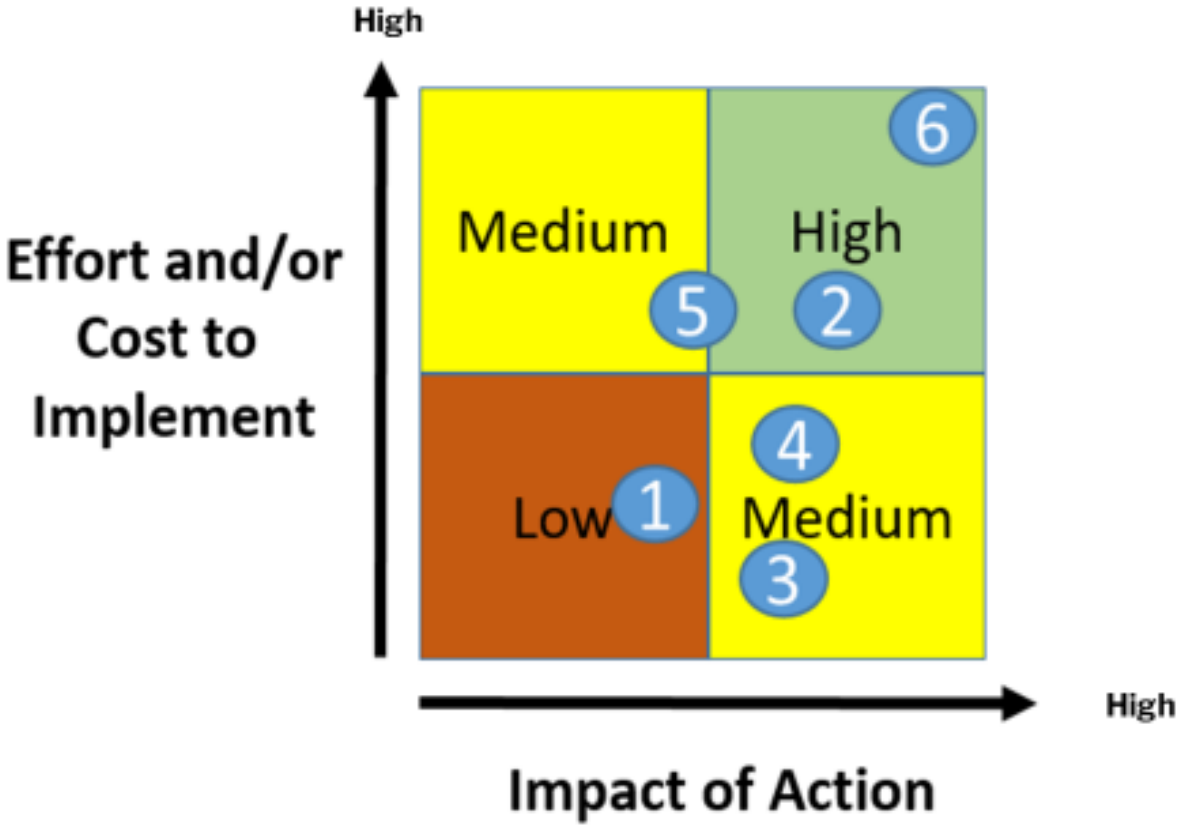
Priorities may involve minimizing releases to the environment to protect water, soil, wildlife.

These photos demonstrate practices or accidents that are begging for better prevention measures.

the first set of photos shows illicit discharges to storm drains. Stormwater pollutants can reach lakes, rivers, and the ocean, impacting water quality and marine life.

The bottom set shows risks to the environment from poor outdoor storage practices, spills, etc. Tire piles can result in leachate that can runoff to waterways. The piles can also harbor mosquitos and rodents.

Prioritizing Implementation (Priority = Protect Water Quality)



This matrix helps identify actions that could be taken based on the effort or cost to implement compared to the impact of the action. Depending on your situation, you may not have much money so would want low-cost solutions with higher impact. Alternately, you may be very concerned about impact and be willing to spend what it takes to achieve very high impact.

let's use a hypothetical priority of protecting river water quality:

Say, the team has identified several actions -

1) Stencil storm drains to educate people that anything poured into the drain goes directly to the river
2) Build swales to detain stormwater runoff and allow water to soak into the ground where it can be naturally filtered.
3) Mail and social media outreach to educate people about the importance of and ways to protect river water quality
4) Visit businesses in person and educate them about the importance of and ways to protect river water quality
5) Install liners in all catch basins and maintain them
6) Build a new pump station with the state-of-the-art filtration

Using cost-benefit analysis, you can glean information about the level of effort required and assess how successful you think the activity might be.

Putting these actions on the priority matrix helps visualize what to do first.
For example, the easiest action to do but may also have limited success, was action 1, stenciling storm drains. Compare this to action 6 - building a new pump station. It's a very high cost but it's going to help filter out

Jean S. Waters

POLLUTION PREVENTION
resource center

pprc

PPRC Program Manager

- 25+ years in Pollution Prevention
- Coordinated multiple projects through stakeholder engagement, planning, facilitation, and implementation
- M.S. in Chemical Engineering from Kansas State University
- Happy grandmother and life-long fan of the Kansas State Wildcats (EMAW)