

The use of hazardous chemicals in the maple industry has increased the potential for accidents, including syrup and environmental contamination, chemical spills and personal injury. Chemical safety must be a priority in maple sugaring operations. This brochure describes the most common hazardous chemicals used in sugaring, outlines general guidelines for safely using hazardous chemicals and provides resources where further information can be obtained. The careful use of chemicals helps to ensure that maple products remain pure.

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Chemical Safety in Maple Sugaring Operations



Photo by: Tim Wilmot

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INTRODUCTION

The use of hazardous chemicals in maple sugaring operations has been increasing steadily. The chemicals currently used for reverse osmosis (RO), pan and tubing cleaning, and in some other maple practices are often extremely hazardous, industrial-grade chemicals; they are frequently more concentrated and present a much higher level of danger to personal safety and syrup contamination than general-use household chemicals. However, the real hazards of these chemicals are frequently overlooked or understated. It is sometimes unclear from a product's label alone what chemicals it contains and in what concentrations, what the chemical's hazards are, and how it can be used safely.

It is imperative to use, store and dispose of these chemicals properly in order to protect your own personal safety and prevent chemical contamination of syrup and the environment. This brochure is intended to raise awareness among sugarmakers about hazardous chemicals commonly being used in sugaring operations as well as the need to use these materials safely, in a way which protects personal and food product safety. This brochure will outline 1) the most common types of chemical hazards associated with sugarhouse chemicals, 2) basic guidelines for using chemicals safely, and 3) where to get more detailed information.



A chemical storage cabinet in a sugarhouse. These cabinets are a great way to store chemicals safely. They minimize the extent of spills, contain small fires and keep chemicals dry, away from incompatible chemicals, food and the public.

Note: The intention of this brochure is to provide basic advice and a general introduction to chemical safety information only. Its purpose is not to supply detailed information on how to comply with any safety laws or regulations. It is the responsibility of the producer to gather all required information and to abide by all applicable precautions, laws and regulations. Information on where to obtain further compliance information and more detailed chemical safety information is included at the end of this brochure.

CHEMICAL HAZARDS IN THE SUGARHOUSE

“Hazardous materials are any chemicals which present either physical or health hazards to life or property” (University of Vermont Environmental Safety Facility, UVM ESF). There are three basic categories of physical hazards: flammability, corrosivity and reactivity, and one health hazard category: toxicity.

Flammables include any liquid which is ignitable at room temperature.

Corrosive chemicals are those that are acidic (have low pH values) or alkaline (have high pH values). Though regulations differ, a general rule of thumb is that solutions with pH values of 4.0 or lower are hazardously acidic, and those with pH values of 10.0 or greater are hazardously alkaline.

Reactive chemicals have the ability to react violently under many circumstances, including upon contact with air, water or other incompatible chemicals.

Toxicity is “the ability of a chemical substance to cause an undesirable effect in a biological system” (UVM ESF). Information on a chemical’s toxicity includes whether the chemical in question has acute and/or chronic effects (acute effects are the result of short-term exposure, while chronic effects are the results of repeated exposures over time), what the target organs of the chemical are, and whether the effects of the chemical are local (at the site of exposure) or systemic (away from the site of exposure) (UVM ESF).

Almost all of these hazard types can be found in chemicals used in sugaring, and each individual chemical can fall into more than one hazard category.

More Information

Flammable and combustible liquids –
<http://www.ccohs.ca/oshanswers/chemicals/flammable/>

What makes chemicals poisonous –
<http://www.ccohs.ca/oshanswers/chemicals/poisonou.html>

Chemical hazard information –
http://esf.uvm.edu/chem_comp_chart.pdf

More Information

How to work safely with corrosives –
<http://www.ccohs.ca/oshanswers/prevention/corrosi1.html>

Hazards of corrosives –
<http://www.ccohs.ca/oshanswers/chemicals/corrosive/corrosiv.html>

Toxics

All chemicals used in sugaring are toxic to some degree. For example, formaldehyde-based membrane storing solutions are toxic because formaldehyde is considered a likely human carcinogen. If possible, the use of toxic chemicals should be avoided in sugaring operations. If it is absolutely necessary to use toxics, extreme caution should be used to ensure absolutely no residue remains on the membrane prior to use.

Corrosives

By far the most common types of hazardous chemicals used in sugaring are corrosives.

Many cleaners or detergents used for reverse osmosis (RO) contain citric or phosphoric acids often in concentrations ranging from 30 to 100%. Some RO soaps contain sodium hydroxide, a hazardously alkaline chemical, in concentrations from 30 to 100%. The main ingredient in many tubing and pan cleaners is phosphoric acid, present in widely varying concentrations. Other pan cleaners sold are 92% concentrated sulfamic acid. Membrane storing solutions containing sodium metabisulfite are also corrosive.

Regardless of the concentration, all of these materials are hazardous, corrosive chemicals. They are far more concentrated, and thus far more hazardous, than any similar chemicals sold for household use. The corrosivity of these chemicals (represented by their pH values), either as purchased or when diluted for use, is at a level which is unsafe for unprotected skin contact.

In general, exposure to corrosive chemicals can cause severe skin burns, permanent eye damage and respiratory damage if inhaled. Ingestion of corrosive chemicals can cause burns to the mouth, throat or digestive tract, and can be potentially fatal. Extreme care needs to be taken to prevent corrosives from contaminating syrup!

Always *add* corrosives to water when diluting or mixing. When using corrosive chemicals (such as acid pan cleaners or alkaline sodium hydroxide RO soaps), you should always add the material slowly, while stirring, to the water and NEVER add water to the corrosive. Acids and alkalines react strongly when mixed with water, often causing splashing. By adding the corrosive to the water (instead of the reverse), any splashed material is more likely to be a dilute mixture with water, rather than a concentrated corrosive.

GUIDELINES FOR USING CHEMICALS SAFELY

The following is an outline of some simple steps you can take to use hazardous chemicals more safely. It is not a comprehensive set of guidelines - for more information on how to use, store and dispose hazardous chemicals safely, contact the safety resources listed at the end of this brochure.

1. Obtain the Material Safety Data Sheet (MSDS) for every chemical used in your operation

- The MSDS should contain all of the information necessary to safely use and store each chemical. Occasionally, the information on an MSDS can be limited or difficult to interpret. In this situation, the best way to find out more information is to call the manufacturer's phone number listed on the MSDS.
- When you purchase a chemical, the dealer or retailer is required to give you its MSDS sheet on request.

More Information

Material safety data sheets –
<http://www.ccohs.ca/oshanswers/legisl/msdss.html>

Glossary of Common terms in MSDSs –
<http://www.ccohs.ca/oshanswers/chemicals/glossary/>

Note: Depending on the nature of your business, laws that govern workplace safety may apply, and you may be required to maintain a copy of all MSDSs onsite. The Occupational Safety and Health Administration (OSHA) Office of Small Business Assistance can help you determine if this or any other federal (or state, if applicable) OSHA regulation is applicable to your business through a free and confidential compliance assistance consultation. Contact information is provided at the end of this brochure.

2. Using the MSDS, identify the necessary information for using the chemical safely. In general, you want to be able to answer the following questions before you begin using any chemical:

- What are the physical hazards of this chemical?
- What are the health hazards?
- What is the concentration of the chemical?
- What are the possible routes of entry - can it enter through the skin, or by inhalation?
- Could there be potential health effects from ingesting syrup that has come in contact with this chemical?
- How can this chemical be stored safely? Can it be exposed to freezing temperatures without harm?
- Are there other chemicals this one is incompatible with, and should not used with or stored near?
- What personal protective equipment is necessary for using this chemical?
- What emergency equipment is necessary if this chemical is spilled or an accidental exposure occurs?



Always be aware! The directions for this extremely corrosive RO soap instruct you to use 'One capful'. Using the cap to measure the chemical leaves a lot of chemical residue in the cap, creating a dangerous hazard for the next person who opens the bottle.

Photo by: Mark Isselhardt

3. Be aware and have an emergency plan

- Once you've identified the chemical you're working with and before you begin your work, think carefully about what you're about to do. Plan ahead for what action you'll take if an accident occurs. Even when careful attention is paid to prevention, accidents can happen and it is especially important to be prepared when an accident could involve hazardous chemicals.

More Information

Glove selection –
<http://www.ccohs.ca/oshanswers/prevention/ppe/gloves.html>

Safety glasses and face protectors –
<http://www.ccohs.ca/oshanswers/prevention/ppe/glasses.html>

Selecting PPE for individual chemicals:
National Institute for Occupational Safety and Health (NIOSH)
Pocket Guide to Chemical Hazards –
<http://www.cdc.gov/niosh/npg/npg.html>

Emergency showers and eyewash stations –
http://www.ccohs.ca/oshanswers/safety_haz/emer_showers.html

- Let the people around you know what you're doing and that you're working with a hazardous chemical. This is especially important if chemicals are being used in an area that children or the public have access to.

MSDSs are important emergency equipment. The MSDS is the best source of information for emergency personnel in case of an accidental contamination or spill. Having the MSDS ready for emergency personnel at the time of an accident is imperative and will allow them to respond more quickly and effectively. The simple step of keeping a readily available copy of the MSDS for each chemical used in your operation could lessen the severity of an injury or accidental release, or prevent a fatality.

4. Use the appropriate personal protective equipment (PPE)

- The PPE required for each chemical should be indicated on the MSDS. This can include protective clothing (such as heavyweight coveralls), chemical resistant gloves, chemical goggles or even a faceshield.



Photo by: Mark Isselhardt

Cleaning pans with the appropriate personal protective equipment, including chemical-resistant gloves, protective clothing and a faceshield.

5. Have the right emergency equipment

- The MSDS should also indicate what emergency equipment is necessary for each chemical, such as a safety shower, eyewash or chemical spill kits.
- Having this emergency equipment and knowing how to use it is critical. Using an eyewash within the first 10-15 seconds of exposure to acid can potentially prevent permanent eye injury or blindness.
- Emergency devices designed for use in buildings without plumbing are available.

6. Dispose of the chemicals properly

- Because these are hazardous, industrial grade chemicals, **ANY** process that uses these chemicals is producing a waste product (such as wash water) that will require special disposal procedures and cannot be disposed of directly into septic systems, municipal waste systems or onto the ground. This will apply to wash water you may have previously considered relatively harmless.
- In general, the objective is to ensure waste is being disposed in a way that doesn't cause harm – to septic systems, pipes, water sources, municipal waste systems, soil, trees in the sugarbush, etc.
- Determining what disposal procedures are required for each type of waste is complex, and depends on many factors including the composition of the waste and the nature and location of your operation.
- Fortunately, most states have Small Business Assistance Programs (SBAPs) that provide free, confidential environmental compliance consultations which will help determine how your waste can be legally disposed. Contact information is provided at the end of this brochure.

Dilution is not the solution! It seems logical that diluting a concentrated chemical during a process such as RO washing would reduce the hazard of that chemical. However, even when diluted with thousands of gallons of water, the wastewater produced using sugarhouse chemicals will still always require special disposal procedures.



Photo by: George Cook

Sugarhouses are often places where the whole family and the public have access to. This is an important reason why chemical safety should be a priority in any sugarhouse.

- **You must determine how to legally dispose of each individual waste you produce.** To make this determination:
 1. Determine the characteristics of each of the different types of waste being produced in your operation. This will include RO wash water, and water produced after pan and tubing cleaning. Identify the chemicals that are present in each waste by checking the MSDS for the chemicals used.
 2. Contact the SBAP Hotline in your state. Using the information you provide, they will help you determine how to safely and legally dispose of the waste. This may include neutralization, contacting your municipal waste system prior to release, or in some cases collecting the material to be disposed of as hazardous waste.
- The SBAPs can also help you determine how to dispose of unused hazardous chemicals.

7. Store chemicals safely

- The MSDS sheet should also contain information on how to safely store each chemical.
- Always store chemicals apart from other incompatible chemicals. Each container should be clearly labeled with the chemical name and its hazard (Example: Phosphoric acid, 35% - CORROSIVE!).
- Containers should be made of a material compatible with the chemical, should be able to be closed or sealed, and should be free from any damage which would allow leaks or spills.
- All chemicals should be stored in cool, dry locations away from food and where the public or children do not have access. You may wish to purchase a chemical storage cabinet to provide a safe and secure storage location.



Photo by: Mark Iselhardt

What's wrong with this picture?

In this chemical storage cabinet, *acid* pan and RO cleaners are being stored right next to *alkaline* RO soap. These are incompatible with each other and storing them together could lead to very dangerous accidental reactions. **NEVER** store acids with alkalines.

8. Follow the manufacturer's directions

- Chemicals are only safe to use at the dilution levels indicated in manufacturer's instructions, and only for the purposes described by the manufacturer.
- Doubling the recommended concentration of a chemical does not double its effectiveness – but it does hugely increase the risk of injury if an accidental splash or spill occurs and increases the damage to equipment. If the chemical does not come with instructions, call the dealer or manufacturer to obtain them.

Mixing sugarhouse chemicals. Mixing of incompatible chemicals (such as mixing an acidic chemical with an alkaline one) can cause very dangerous, unpredictable reactions, even explosions.

9. Use chemicals approved for use in the sugaring industry only

- All chemicals used in any part of a sugaring operation should be approved for 'Food Use'.
- Chemicals sold for other industries or purposes are not appropriate for use in sugaring.

10. If you don't know – ask!

- The following are resources where you can obtain more information to help you use chemicals more safely.

WHERE TO FIND MORE INFORMATION

Compliance Information

Small Business Assistance Programs (SBAPs) – For compliance assistance with environmental regulations on the disposal of hazardous chemicals or wastes produced using hazardous chemicals, SBAP Hotlines provide free, confidential consultations to small businesses.

<u>State</u>	<u>Hotline</u>	<u>Website</u>
MA	(617)-626-1060	http://www.mass.gov/envir/ota/
ME	(800)-789-9802	http://www.maine.gov/dep/oia/sbta/
MN	(800)-657-3938	http://www.pca.state.mn.us/programs/sbap_p.html
NH	(800)-837-0656	http://www.des.state.nh.us/SBTAP/
NY	(800)-780-7227	http://www.nysefc.org/tas/SBAP/SBAP.htm
OH	(800)-329-7518	http://www.epa.state.oh.us/ocapp/sb/index.html
VT	(800)-974-9559	http://www.anr.state.vt.us/dec/ead/sbcap/index.htm

A complete listing of SBAPs for each state can be found at:
<http://www.smallbiz-enviroweb.org/sba/sbap.html>

Note: If your state's SBAP does not currently provide compliance assistance, the following link provides a listing of other compliance assistance resources by state:
<http://www.smallbiz-enviroweb.org/sba/seasbapweb.html>

OSHA Office of Small Business Assistance Consultation Programs – For compliance assistance with federal (or state, if applicable) OSHA regulations, such as Hazard Communication (MSDSs, chemical labeling and documentation) and the use of hazardous chemicals in the workplace, OSHA provides free, confidential consultations to small businesses. A directory of consultation projects in each state can be found at:

http://www.osha.gov/dcsp/smallbusiness/consult_directory.html

Vermont Consultation Program (Project WorkSAFE) Hotline: (800)-SAFE-YES

Other – The National Agriculture Compliance Assistance Center provides comprehensive information on environmental requirements which affect agriculture. Their hotline is available to answer environmental compliance questions related to agriculture.

Hotline: (888)-663-2155 or <http://www.epa.gov/agriculture/index.html>

General Safety Information

Canadian Centre for Occupational Health and Safety OSH Answers

<http://www.ccohs.ca/oshanswers/chemicals/> ~ This site provides easy to read fact sheets on numerous subjects related to chemical safety, including how to work safely with corrosive chemicals.

National Ag Safety Database

<http://www.cdc.gov/nasd/index.html> ~ A collection of agricultural safety information and resource materials.

National Institute for Occupational Safety and Health

<http://www.cdc.gov/niosh/homepage.html> ~ NIOSH provides research, information and education on occupational health and safety. Their website has extensive information on chemical safety in the workplace.

Small Business Environmental Homepage

<http://www.smallbiz-enviroweb.org> ~ This site links to safety resources useful for small businesses.

NIOSH Pocket Guide to Chemical Hazards

<http://www.cdc.gov/niosh/npg/npg.html> ~ A searchable database of information on individual hazardous chemicals.

Searchable MSDS website

Vermont Safety Information Resources, Inc.

<http://siri.org/msds/index.php> ~ This site allows you to search for MSDSs by chemical or trade name.

Where to purchase safety supplies

Lab Safety Supply, Inc. ~ <http://www.lss.com> or (800)-356-0783

Grainger ~ <http://www.grainger.com> or (888)-361-8649



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A Quick Guide to Reading a Material Safety Data Sheet

The information provided in the table below should help you to understand how a Material Safety Data Sheet (MSDS) is formatted and what kind of information it contains. It is always a good idea to ask vendors for a copy of an MSDS for a chemical or product **BEFORE** actually purchasing the product. This will allow you to evaluate the product and compare it to others that perform a similar function. By doing this you can select the product or chemical that represents the least hazard to your employees and will result in the least amount of regulation.

What is This Stuff?	
Section I: Product Identity	Allows you to match the MSDS with the product.
Section II: Hazardous Ingredients	Names the hazardous ingredients and tells you the maximum amount you can be exposed to without harm.
How Does This Chemical Behave?	
Section III: Physical Data	Helps to figure out where to store the chemical and how likely it is to evaporate and give off vapors (leading to exposure and/or fires).
Is This Product Dangerous?	
Section IV: Fire and Explosion Data	Discusses when a chemical will ignite and how to extinguish the fire.
Section V: Reactivity Data	Tells you if the substance will explode or breakdown in the presence of sunlight or air.
Can This Product Hurt My Health?	
Section VI: Health Hazards Data	Tells you how the chemical can get into your body (e.g. absorbed through the skin, inhalation, etc.). Explains what the health effects may be if you are exposed and whether it can cause cancer. It also includes first aid procedures.
How Should I Work With This Stuff?	
Section VII: Precautions for Handling	What to do in case of a spill. How to dispose of the waste.
How Should I Be Protected?	
Section VIII: Control Measures	Includes respirators, ventilation, eye protection, or special clothing.

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