How to read - and read into - a MSDS

Michael F. Burnson, CEF

A Material Safety Data Sheet (MSDS) can be your most useful tool in maintaining a healthy and safe working environment for your employees. Unfortunately, there are many times in which an MSDS can be a frustrating and confusing document, thereby defeating its primary purpose.

- One MSDS warned that its product should only be handled with rubber gloves and other personal protective equipment (PPE), as the product was made with potassium hydroxide. The product was waterless hand cleaner.
- One MSDS for sodium dichromate refers to it as an oxidizer while another classifies it as a toxic.
- Zinc dust from one manufacturer is labeled dangerous when wet, while another has no hazard warning.

How can these seemingly obvious contradictions arise? The answers lie in various causes: sometimes a lack of chemical knowledge, sometimes confusing regulatory definitions and regulations, other times over-reliance on software. So how are you to know when these details are correct and separate the useful from the useless? Very simply, a diligent approach by your safety officer is the only way. The following information is offered as a starting point in enhancing your diligence.

An MSDS prepared along the requirements of OSHA's standards is a complex and comprehensive document. To most people, it contains vastly more information than would normally be considered useful. In part, this is due to its objective of providing information to a wide variety of users. The same document must provide information to your safety officer, waste treatment operator, shipping/receiving department, inventory controller, plant personnel, first aid personnel, local fire department, and more. That's why most of them are so long, many now more than ten pages.

Regardless of how familiar you may be with your products, it is very important to take the time necessary to understand the MSDSs for every product in your shop. For most people, there are just two or three sections of major importance – but these sections differ among different personnel.

HAZARDOUS INGREDIENTS – Probably the most widely used section, this provides basic information about what a product contains; physical characteristics such as color and specific gravity may be included here or listed separately. For commodity chemicals, this may be obvious, but many things can be hidden in proprietary products. In general, if a hazardous chemical constitutes 1% of a product, it must be listed on the MSDS; if the chemical is carcinogenic, the threshold is 0.1%.

Exposure data may also be included in this section or delegated to a separate one. Look for such data as exposure limits: PEL – permissible exposure limit; TLV – threshold limit value; IDLH – immediate danger to life or health. These can be expressed

either as milligrams per cubic meter or parts per million. Toxicity data reflects hazards determined by animal tests and are typically expressed as LD_{50} – lethal dose to 50% of the animals tested. Other expressions include LC_{50} (lethal concentration for gases) and LD_{Lo} as well as observed data.

FIRST AID – Insofar as there may be a chemical hazard in a product, this section may be the most important on the whole MSDS. Skin exposure and inhalation are common in production areas, so personnel should know how to respond. Pay special attention to unusual threats, such as skin absorption of certain toxins (cyanides, fluorides, organics) or delayed effects of exposure. In the shop, first aid materials are a necessary complement to first aid information and techniques.

PERSONAL PROTECTIVE EQUIPMENT – Closely tied to first aid is PPE: it is, in effect, the best guide to precluding the need for first aid. Unfortunately, most processing lines work with several chemicals, and PPE will vary among these chemicals. In this case, select the PPE for the most significant hazard. This may or may not be the most likely hazard.

Next to PPE in prevention of risk is exposure control equipment. This includes information about exhaust, fume scrubbers, and maintenance guidelines. Again, working with hazardous chemicals means providing condition appropriate for the greatest hazard.

FIRE FIGHTING and SPILL CLEAN-UP – Worker exposure isn't the only emergency situation that you might face. Loss of product or solution may be serious, sometimes requiring outside emergency personnel to assist in control and clean-up; very large spills may even require notification of the EPA (larger than the reportable quantity). A fire will not necessarily be caused by any of the hazardous chemicals; however, they can aggravate a fire or otherwise place fire fighters at risk.

There's a certain trick in addressing hazardous situations properly. Your MSDS files and information are stored inside your plant or offices – which will be evacuated in the case of a serious emergency. No one is going back into a burning building to look up what's on the MSDSs! In general, these are things that someone from your company must learn prior to any accidents. Time lost in searching for response information is time lost for addressing the problem.

STORAGE – Many chemicals' most serious hazards develop when combined with other chemicals: chromium trioxide is most hazardous when it can react with flammable materials, and the greatest hazard from cyanide compounds is being mixed with acids. They are examples of chemicals that must be segregated during storage (and usage). Of course, all chemicals should be stored in a "cool, dry location", but more details should be available in the MSDS. To be safest, look for information about incompatible materials, conditions to avoid, and similar information.

REGULATORY INFORMATION – This includes such things as shipping (Dept. of Transportation) classification, and EPA and OSHA regulations. Some companies include foreign regulations as well.

So why all the confusion with so many MSDSs? There are three primary sources of this problem: First, there are software programs that generate MSDSs based upon raw materials that the product contains. These programs look up the basic information on each component, but cannot account for combinations. In the example of the waterless hand cleaner, potassium hydroxide is used to saponify the fatty acid component, though an excess of the fatty acid is incorporated into the product. The pH of the final product is close to neutral: there is no potassium hydroxide remaining, only a combination of fatty acid and soap. Inadequate software is perhaps the most common source of this problem, though human error contributes its share to this problem. After all, many MSDS authors miss this same point.

A second source of difficulty is inconsistent interpretations of the myriad EPA and OSHA regulations. Considering that experts cannot agree on many of them, it's easy to understand how this can happen. For example, sodium dichromate is usually considered an oxidizer by manufacturers and distributors. However, some tests indicate that it does not meet the defined criteria of the DOT as an oxidizer, so it may be classified instead as a toxic. Similarly, testing by one company on their zinc dust may indicate that it does not meet the criteria for classification as dangerous when wet nor spontaneously combustible. The problem for you in your shop is that the hazards still exist, but are not so readily obvious to your personnel. The most common reminder of hazard information is product packaging itself; these products don't display any hazard information, and employees tend to think of them as safer than they are.

The opposite happens as well. Many MSDS authors overstate the hazards of their products. Rather than risk a lawsuit from a victim of an industrial accident, product hazards are exaggerated so as to err on the side of safety.

The third common source of confusion is that companies deliberately do not include proper descriptions of hazards on their MSDSs. It happens often that a company either wants to hide a proprietary formula that a competitor might figure out easily, or the author is simply negligent. I have read MSDSs for steel electrocleaners that do not list caustic soda, its primary ingredient, as a hazardous component. Honest mistake? Not very likely. Secret ingredient? Secret as a car with four wheels! Avoiding higher packaging and transportation costs? Well, just maybe…

In all of these cases the problem is to know when an MSDS is correct, when it is exaggerated, or when it is incomplete. There's no way to tell. Each MSDS has to be read and evaluated on its own merits. And you must be diligent as well. Ask questions of suppliers and demand accountability and technical support. If they can't provide it, you and your employees are the ones at risk. Ultimately, it is your responsibility to provide a safe working environment. You and your people deserve cooperation from your suppliers in achieving this goal.