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Hazardous Technical Information Services
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Creating a 'Purple' Market for a 'Green' Cleaner

By Stephen Perez, DLA Aviation HAZMIN and Green Products

Background

Traditionally, the DoD maintenance community uses petroleum-based solvents containing Hazardous Air Pollutants (HAPs) and Volatile Organic Compounds (VOCs) to clean a wide variety of aerospace, ground equipment, and other weapon system-specific components. These hazardous cleaners performed the necessary degreasing tasks, and met the material compatibility and corrosion requirements for the substrates on which the cleaners were used. However, tightening environmental restrictions, especially in southern California, made it urgent to identify effective, low-VOC, HAP-free cleaner alternatives. Particularly, the San Joaquin and South Coast Air Quality Districts' restrictions essentially ruled out continued use of the traditional P-D-680 solvent that was specified in so many DoD maintenance documents.

In southern California, the Navy and the Marine Corps have numerous operational and industrial activities that must meet state as well as federal environmental regulations. In addition to environmental pollution concerns, worker exposure issues and mitigation of exposure to HAPs are a critical issue in many jurisdictions across the United States.

The Navy's NAVAIR Materials Engineering Division at Patuxent River, MD was the lead activity in formulating and testing "Green" alternatives to P-D-680. With DLA Aviation providing funding for testing those alternatives, Dr. El Sayed Arafat's successful research and testing resulted in a trademarked product known as NAVSOLVE®. This product meets the requirements of MIL-PRF-32295A Type II (Cleaner, Non-Aqueous,

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Low-VOC, HAP-Free), and DLA has assigned NSNs for NAVSOLVE® making it readily available in the federal supply system for worldwide use.

Role of DLA Aviation's — HAZMIN and Green Products Branch

DLA Aviation's HAZMIN and Green Products Branch headed by Mr. Calvin Lee, has the primary mission of promoting the increased use of Green Products throughout DoD. According to Mr. Lee, "one way to do this is by funding testing programs that lead to the approval and use of Green Products by multiple military services". A product or process used by all three services is idiomatically referred to as "purple."

As an example of promoting Green Products, DLA Aviation's Engineer Frank DiPofi approached the US Air Force Corrosion Control Office as well as the US Army Aviation Directorate to gauge their interest in adopting this new cleaner. Both services agreed to participate in testing at an agreed site. A delivery order was issued to Integrated Technologies, Inc. (ITI) under an Air Force basic ordering agreement (BOA) to survey potential Air Force and Army users about their desired testing protocol, and to accomplish the recommended testing as well as to produce a final report. Potential users identified several primary criteria for evaluation to include odor, comparative performance testing with other currently used solvent cleaners, and hydrogen embrittlement testing.

Air Force and Army stakeholders then provided their input on how to test the new Green cleaner to their specifications. Laboratory testing and subsequent field testing at the Hill AFB Aerospace Ground Equipment (AGE) shop (Figures 1-3) were successful, and NAVSOLVE® performed beyond expectations.

FIGURE 1. Inland Technology Parts Edge-Tek Washer Summary and Steps

The Edge-Tek parts washer at Hill AFB was drained and filled with NAVSOLVE® for the testing described in this report (an initial fill with ~65 gallons of NAVSOLVE® was followed by an additional ~15 gallons of NAVSOLVE® to bring the cleaner level within equipment supplier's recommended fill volume).

The parts washer operates with the lid closed. When the lid open switch is activated, the lid opens avnd the parts tray is automatically raised up out of the cleaning solution to a position near the top of the tank.

When the lid close switch is activated, the parts tray lowers in to the cleaning solution as the tank lid closes.

FIGURE 2. Summary of Cleaners Tested

LEFT: Two drums of NAVSOLVE® cleaner were used in the testing.

RIGHT: NAVSOLVE® cleaner was placed in a labeled plastic mixing cup for use in the immersion cycling testing procedure for the cleaning efficiency testing. The approximate 500 ml of NAVSOLVE® in the mixing cup was observed to be relatively colorless and odorless.

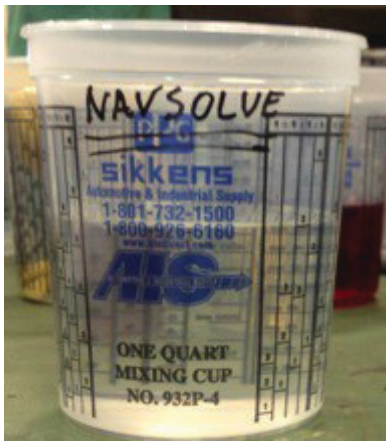

FIGURE 3. Cleaning Efficiency Notes and Observations

LEFT: Coupons with hydraulic fluid and carbon black

MIDDLE: After five minutes cycling in cleaners

RIGHT: After ten minutes drying (NAVSOLVE® left, Breakthrough right)

The US Air Force Corrosion Control Office is evaluating the test results, and plans to add the new Green cleaner to Air Force Technical Orders (TOs) in time for the next round of TO changes. The following general cleaning TOs will be modified:

- 1-1-8 APPLICATION AND REMOVAL OF ORGANIC COATINGS, AEROSPACE AND NON-AEROSPACE EQUIPMENT;
- 35-1-3 CORROSION PREVENTION AND CONTROL, CLEANING, PAINTING, AND MARKING OF USAF SUPPORT EQUIPMENT (SE); and,
- 1-1-691 CLEANING AND CORROSION PREVENTION AND CONTROL, AEROSPACE AND NON- AEROSPACE EQUIPMENT.

In addition, Lockheed Martin Aeronautics (LM Aero) concurrently performed an analysis on the requirements for MIL-PRF-680/A-A-59601/P-D-680 (degreasing/dry-cleaning solvents) noted in F-16 Technical Orders (TOs) with the intent of comparing these application requirements with the performance requirements of MIL-PRF-32295 Type II. Pending a final evaluation by LM Aero and the Air Force, this promising development should widen the customer base to include USAF and FMS F-16 fleets worldwide.

How to Order NAVSOLV®

All authorized users can order the product using the following NSNs, using MILSTRIP requisitioning procedures or at DoD eMALL:

- 6850-01-606-8356 (1 GL);
- 6850-01-606-8357 (5 GL);
- 6850-01-606-3293 (15 GL); and,
- 6850-01-606-8358 (55 GL).

For more information contact:

NAVAIR: Dr. El Sayed Arafat
PH / Commercial: 301.342.8054
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This article is based, in part, on a Final Report by Kevin L. Klink, PE, and Glenn Zinkus, CEF 3 integrated Technologies, Inc.

Department of Tranportation News

DoT Maintains the Combustible Liquid Hazard Class for Domestic Shipment

By Abdul H. Khalid, Chemical Engineer, HTIS

The harmonization of the Hazardous Materials Regulations (HMR), 49 CFR Parts 171-180, with those of the United Nations (UN)'s recommendations as they apply to the transportation of combustible liquids continues to be a topic of much discussion.

The U.S. Department of Transportation (DoT)'s Pipeline and Hazardous Materials Safety Administration (PHMSA) regulates the transportation of hazardous materials to ensure the safe and secure movement of hazardous materials by all modes (land, air, water) of transportation including pipelines. PHMSA's Office of Hazardous Materials Safety (OHMS) develops regulations and standards for the classifying, handling and packaging of over one million daily shipments of hazardous materials within the United States, while ensuring minimal threats to life, property or the environment due to these materials, and related incidents or accidents that might occur.

On May 30, 2012, the PHMSA withdrew its Advance Notice of Proposed Rulemaking (ANPRM) of April 5, 2010, and denied petitions P–1498, P–1531, and P–1536. In its Advance Notice of Proposed Rulemaking (ANPRM) of April 5, 2010, in the Federal Register [75 FR 17111] under Docket No. PHMSA–2009–0241 (HM–242), PHMSA had solicited comments on whether it should consider the harmonization of its Hazardous Materials Regulations (HMR; 49 CFR parts 171–180) with those of the UN Recommendations as they apply to the transportation of combustible liquids, and still maintain an adequate level of safety. The major issues examined and addressed were:

- Safety (hazard communication and packaging integrity);
- International commerce (frustration/delay of international shipments in the port area);
- Increased burden on domestic industry (elimination of domestic combustible liquid exceptions); and,
- Driver Eligibility (exception from placarding which would exempt seasonal workers from the Federal Motor

Carrier Safety Administration's Commercial Driver's License (CDL), and Hazmat Endorsement requirements, and the Transportation Security Administration's (TSA) fingerprinting and background check provisions).

Two of the petitions suggested that domestic requirements for the transportation of combustible liquids should be harmonized with International standards, and one petition suggested that the HMR should include more expansive domestic exceptions for shipments of combustible liquids.

With the issuance of its May 30, 2012, notice, PHMSA decided to deny the International Vessel Operators Dangerous Goods Association (IVODGA) petition, P–1498, the Dangerous Goods Advisory Council (DGAC) petition, P–1531, and U.S. Consumer Harvesters Inc. petition, P-1536 as well as to withdraw its ANPRM of April 5, 2010.

The treatment of flammable liquids in the U.S. HMR is at variance with the UN Recommendations. In the U.S., flammable liquids may be reclassed as combustible liquids due to the material's flash point, that is, the temperature at which a material emits an ignitable vapor, and can catch fire. In most cases, the lower the flash point, the higher the fire hazard. One can compare and contrast the two systems in the table below.

There are a significant number of domestically regulated materials that pose risks during transportation, and they cannot be ignored. PHMSA's decision disagrees with those who favor the elimination of the combustible liquids hazard class because there is no such classification under the international standards, and its denial of those petitions to eliminate the combustible liquid hazard class in domestic shipping is based on the costs associated with the implementation and harmonization of combustible liquids with the UN recommendation. For the present, PHMSA will retain the combustible hazard class for the domestic shipment.

For additional information, one should contact Vincent Babich, Standards and Rulemaking Division, phone: 202- 366–8553, Office of Hazardous Materials, PHSMA, U.S. Department of Transportation, New Jersey Avenue SE., 2nd Floor, Washington, DC.

Reference:

Federal Register, /Vol. 77, No. 104, May 30, 2012, website: http://www.gpo.gov/fdsys/pkg/FR-2012-05-30/pdf/2012-12958.pdf.

Flash Point	UN Recommendations	HMR (domestic ground shipments)
Below 100 F	Flammable (Class 3)	Flammable (Class 3)
100–140 F	Flammable (Class 3)	Flammable (Class 3) – With option to reclassify as combustible non-bulk shipments excepted.
>140–200 F (a.k.a. High Flash Point, Combustible Liquids or HFCLs)	Unregulated	Combustible (bulk only), non-bulk shipments excepted.
Above 200 F	Unregulated	Unregulated

TABLE 1. Flash Point Recommendation

Environmental News

Access and Inspection Authorities at Federal Facilities

By Abdul H. Khalid, Chemical Engineer, HTIS

The National Federal Facilities Compliance and Enforcement Programs ensure that Federal agencies are in compliance with major environmental laws. The U. S. Environmental Protection Agency (EPA) enforces environmental laws and the regulations that flow from them. In addition, it provides guidance for owners and operators of private as well as Federal facilities in understanding these environmental laws and regulations, and the manner in which they are implemented. The EPA can authorize State environmental regulatory agencies to inspect Federal facilities in the same manner in which these State agencies inspect any commercially regulated facility. This authority flows from major federal environmental statutes that contain provisions for granting access and authority to conduct regulatory inspections.

Federal, State, or tribal inspectors can conduct inspections because the EPA works in partnership with these state, tribal, and local agencies to see that federal facilities meet their environmental requirements.

Handling Regulatory Inspections

Upon learning that its facility will the subject of a state environmental inspection, the Federal Facility should designate a team of individuals who work at the facility and who have a thorough knowledge of the applicable environmental laws and regulations associated with the mediums being inspected. In addition, these team members should know the procedures related to regulatory inspections and the protocols applicable when the inspectors arrive, are in the facility or after they leave. As always, the Office of Counsel should also be involved with the team members, particularly when there are some sensitive issues with any part of an inspection, or when civil or criminal investigations are involved.

The Federal Facility team member(s) should:

- Determine the nature of the inspection and its scope, and, if it is either criminal or civil in nature, the Office of Counsel should be informed immediately;
- Remain with the inspector(s) throughout the inspection. It is advisable to take notes as appropriate for any comments or observations which the inspector(s) make during the course of inspection or investigation;
- Make arrangement for documents or photographs if the inspector needs them; and keep a record of the documents or photographs;
- Ask the inspector or inspectors if any compliance sampling is to be conducted; and,
- Keep detailed notes regarding the activities during and after an inspection. On occasions, an inspector goes beyond the scope of the inspection, and if so, one needs to consult the legal counsel in case there are differences of opinion.

Since a state environmental regulatory agency or a federal environmental agency has broad inspection authority, a Federal Facility can find it challenging to know how to handle an environmental inspection especially when inspectors appear to go beyond their legal authority. The Federal Facility team is responsible for protec ting the facility's legal interests, and needs to respond to environmental inspections as appropriate.

Below are listed some of the statutory inspection and entry provisions related to major environmental laws:

Clean Air Act (CAA): Inspector(s) may enter any premise to access and copy records, inspect monitoring equipment, and sample any emissions for the purposes of developing standards, determining violations, and gathering other information to carry out the law as noted in 42 U.S.C.A. § 7414(a) (2); § 7414(b).

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA): Inspector(s) may enter any facility, vessel, or property where it is reasonable to believe there may be a release or a threat of a release of hazardous substances, pollutants, or contaminants and where entry is necessary to determine, choose, or perform a response action, or to otherwise enforce the law as set forth in 42 U.S.C.A. § 9604(e) (1). The authorized inspectors are: EPA inspectors, EPA contract inspectors or EPA designated employees of state or tribal governments.

Clean Water Act (CWA): Inspector(s) may enter —

a) Any facility where an effluent source is located to copy records, inspect monitoring equipment, and sample any effluents for the purposes of developing standards, determining violations, or otherwise carrying out the law as noted in 33 U.S.C.A. § 1318(a), § 1318(c); or

b) Enter any facility or board any vessel, except public vessels as defined in 33 U.S.C. § 1321(a) (4), in order to access and copy records, inspects monitoring equipment, and samples any emissions for the purpose of carrying out the law, and as set forth in 33 U.S.C.A. § 1321(m) (1) (A), § 1321(m) (2) (B). The authorized inspectors are: EPA inspectors, EPA contract inspectors, or EPA designated employees of state governments, after presenting EPA credentials.

Solid Waste Disposal Act (SWDA) as amended by the Resource Conservation and Recovery Act (RCRA): Inspector(s) may enter: a) any establishment or other place where hazardous wastes are or have been managed to inspect, obtain samples, access and copy records, and interview persons for the purposes of developing regulations or enforcing the law as provided in 42 U.S.C.A. § 6927(a); b) locations of underground storage tanks to inspect, obtain samples, access and copy records, to conduct monitoring and testing, and to take corrective actions for the purposes of developing regulations, conducting a study, or enforcing the law as set forth in 42 U.S.C.A. § 6991d (a); c) places where medical wastes are or have been managed to request information, access and copy records, conduct monitoring or testing, inspect and obtain samples for the purposes of developing regulations, reports or enforcing the law at noted in 42 U.S.C.A. § 6992c (a). As with previous regulatory statutes, the authorized inspectors are: EPA inspectors, EPA contract inspectors, or EPA designated employees of state or tribal governments.

Toxic Substances Control Act (TSCA): Inspector(s) may enter and inspect any premises at which chemicals are manufactured, processed, stored or held, and enter and inspect any means used to transport chemicals, and to inspect records, files, processes or controls to determine compliance with TSCA as set forth in 15 U.S.C.A. § 2610(a) – (b). Again the authorized inspectors are: EPA inspectors, EPA contract inspectors, or EPA designated employees of state governments, after presenting EPA credentials and written notice.

In summary, when one's facility is to be inspected by state and/or federal entities, one should consult and coordinate with one's Agency or Service component headquarter' s counterparts far enough in advance to ascertain and understand the protocols associated with inspections.

For additional information and assistance on how to handle an environmental inspection, interested personnel can review at EPA's website: http://www.epa.gov/oecaerth/contact/fedfac-regional.html.

References:

1. Federal Facilities Inspections: A guide to EPA's access and inspection authorities, website at: http://www.epa.gov/compliance/resources/publications/federalfacilities/compliance/accessbrochure.pdf

2. Compliance & Enforcement at Federal Facilities website at: http://www.epa.gov/oecaerth/federalfacilities/compliance/monitoring.html

Labeling Provisions for Suppliers under the New Hazard Communication Standard

By Abdul H. Khalid, Chemical Engineer, HTIS

The U.S. Occupational Safety and Health Administration (OSHA) modified its Hazard Communication Standard (HCS) or HAZCOM 2012 to align it with the United Nation's (UN) Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The HAZCOM 2012 final rule is available at: http://www.gpo.gov/fdsys/pkg/FR-2012-03-26/html/2012-4826.htm, and became effective on May 25, 2012. The new HCS contains the following modifications:

- Revision to the classification of chemical hazards;
- Revision to the labeling provisions and requirements for the labels of hazardous workplace products as well as the use of standardized signal words, pictograms, hazard statement, and precautionary statements;
- Specified format for safety data sheets (SDSs); and,
- Revision to some definition of terms, and the requirements for employee's training on labels, and SDSs.

HCS Labels

The product label is important because it is a worker's first source of information with respect to the product and its related hazards, and helps workers determine how to protect themselves from the adverse effects related to their health and safety while using the products. HAZCOM 2012 requires supplier labels to be easy to read as well as durable, and should be in English, or in the native language of the country in which the product is sold and used.

OSHA has updated its requirements for labeling of hazardous chemicals under its new HCS, and requires compliance with all the provisions of the HCS for preparation of new labels and SDSs by June 1, 2015. After June 1, 2015, all labels are required to have the following elements:

- Product Identifier;
- Pictograms;
- A Signal Word;
- Hazardous and Precautionary Statement; and,
- Supplier Identification.

A sample of the revised HCS label, identifying the required label elements is provided below. One may also provide supplemental information on the label if needed.

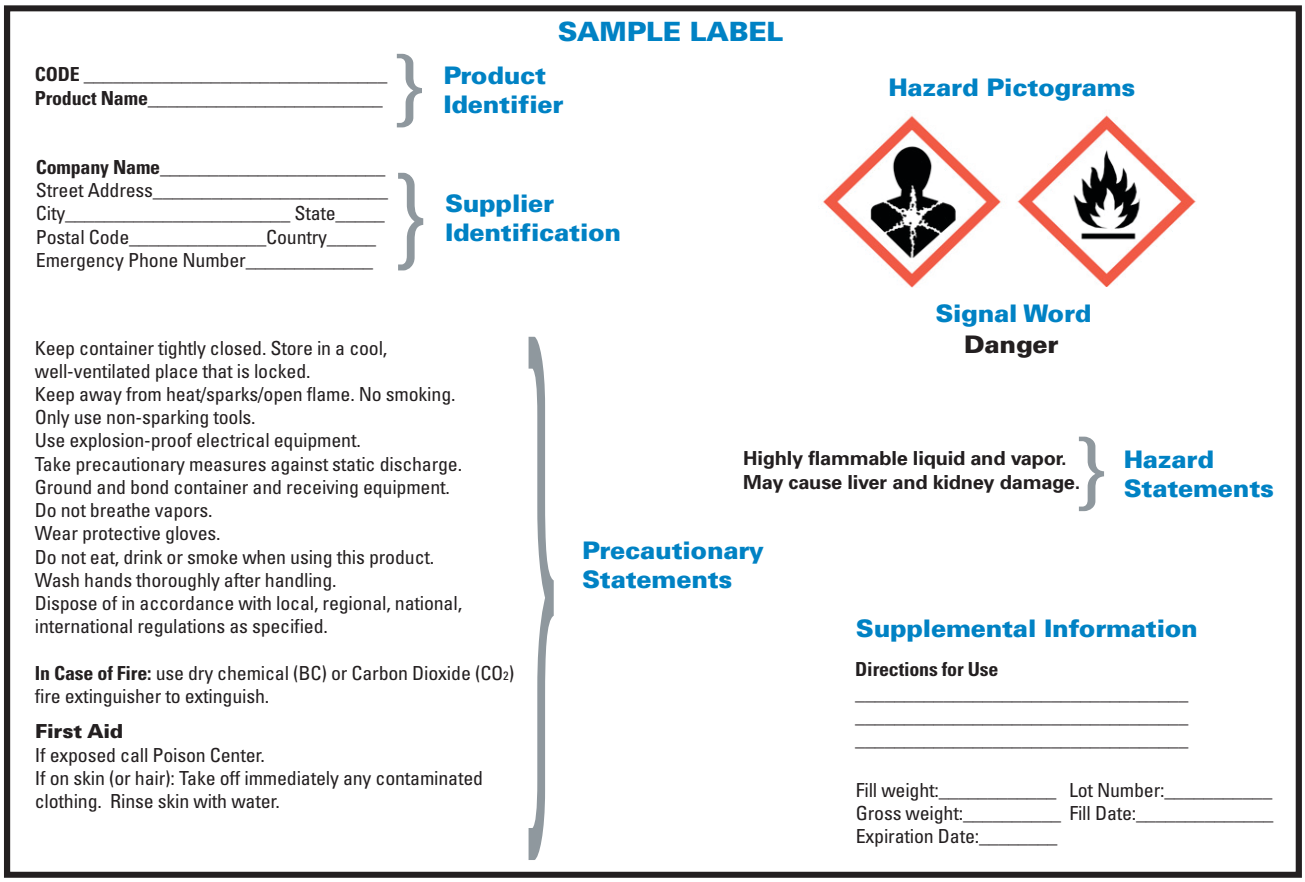

FIGURE 1. Hazard Communication Standard Label — a sample OSHA revised HCS label identifying the required label elements.

For general information and press inquiries, contact:

Mr. Frank Meilinger
OSHA Office of Communications
U.S. Department of Labor
Washington, DC

PH / Commercial: 202.693.1999

For technical information contact:

Ms. Dorothy Dougherty
Director, Directorate of Standards and Guidance
OSHA, U.S. Department of Labor

PH / Commercial: 202.693.1950

Or, visit the OSHA website at: **http://www.osha.gov/index.html**

References:

1. Hazard Communication Standard Labels, website at: http://www.osha.gov/Publications/HazComm_QuickCard_Labels.html

2. Federal Register, Volume 77, Number 58, Monday, March 26, 2012, pages 17574-17896.

Shelf-Life

By Dominique Stutts, Chemist, HMIRS

The Defense Logistics Agency's (DLA) primary role is to provide the military and other federal agencies with the full spectrum of logistics, acquisition and technical services. The DLA provides 100 percent of the consumable items that are required by the military to operate. Consumable items include food, fuel and energy, uniforms, medical supplies and construction and barrier equipment. In addition to managing these items, the DLA also provides approximately 84 percent of the military's spare parts.[1] For example, DLA Aviation located in Richmond, Virginia manages the supply, storage and distribution of more than 1,300 major weapon systems and is the military's primary source for over 1.3 million repair parts and operating supply items. Many of these parts include spare aircraft engines, airframe and landing gear parts, and flight safety equipment and propeller systems. In addition to spare parts, all of the materials required to keep these parts operational are also managed by DLA Aviation.[2]

With the variety and vast number of items which the DLA manages for the military, the condition of these items must also be considered. Due to the deteriorative characteristics of many items, proper maintenance is necessary to ensure that the customer is provided with fresh and useable materials. These deteriorative characteristics can be chemical, biological or mechanical. Chemical deterioration includes metal corrosion and any chemical reaction that occurs spontaneously. Biological deterioration includes damage caused by living organisms such as bacteria, mold and insects. Mechanical deterioration includes the absorption of water by organic materials and thermal expansion.[3] When performing maintenance, these deteriorative characteristics must be considered by monitoring, what is termed "shelf-life". As defined by the Department of Defense's (DoD) shelf-life program, shelf-life is "the total period of time, beginning with the date of manufacture, cure, assembly, or pack (subsistence only), that an item may remain in the combined wholesale (including manufacturer's) and retail storage systems, and still remain usable for issue and/or consumption by the end user".[4] In other words, the shelf-life of an item is the total period of time that the item can exist in storage, or on a shelf and remain usable.

The DoD shelf-life program has established a process to alleviate the risk of shelf-life expiration. The program provides the policies and procedures for the management of materials that possess deteriorative properties and require a shelf-life. Items that are assigned a National Stock Number (NSN) in the Federal Supply System will also be given a specific shelf-life code. This code represents the length of time of the material's shelf-life and is expressed in months. If an item is not designated as a shelf-life item, in accordance with the DoD shelf-life program, then the item is considered non-deteriorative and therefore does not have a shelf-life. Non-shelf-life items are identified with the Shelf-life Code 0 (zero).[4] Items such as degreasers and lubricants have indefinite shelf-lives if stored unopened, indoors at temperatures between 32°F and 130°F.[5]

Product specialists in collaboration with the appropriate military component Engineering Service Activity assign Shelf-life codes based upon a technical evaluation of the deteriorative or unstable characteristics of the items. Each item is assigned only one shelf-life code. The code designates the item as either a Type I or Type II, and assigns the shelf-life period (in months) for the item. Type I items that exceed their shelf life are turned in to DLA Disposition Services when they reach their expiration date and the material is unfit for use. In other words, these items have a definite and non-extendible shelf-life.[4] Food products, pharmaceuticals and biological materials are examples of Type I items.[6] Type II shelf-life items are those having an assigned shelf-life period that, after review, may be extended. When Type II items reach their shelf-life, they are visually inspected, laboratory tested and/or given other restorative actions to specifically extend their shelf-life.[4] For example, items such as containers, drums, tanks, lines and associated equipment are inspected every month for leaks. If a non-repairable leak is observed, the material housed in the container will be transferred to another container and the original is discarded.[6] In addition to being a Type I or Type II item, an alpha character is assigned to the item to further describe the shelf-life. For example, a Type II item with an associated alpha character of C, indicates that the item is serviceable with the customer's concurrence required prior to issue.[4]

Failure to assign proper shelf-life codes increases the risk of, unnoticed, material deterioration. Without proper coding, the deteriorative properties of the item are completely unknown and deterioration could occur without knowledge that it is deteriorating. The item could, therefore, deteriorate while in storage or even after the item has been placed in the user's possession. The ultimate outcome of improperly assigned shelf-life codes is adverse safety and health situations. It is therefore extremely

important to understand the shelf-life code process and abide by the regulations relating to shelf-life.

References:

1. DLA at a Glance: http://www.dla.mil/Pages/ataglance.aspx
2. Defense Logistics Agency Aviation: http://www.aviation.dla.mil/
3. Northern States Conservation Center. How Temperature and Relative Humidity Affect Collection Deterioration Rates: http://www.collectioncare.org/pubs/v2n2p1.html
4. Department of Defense Shelf-Life Program: https://www.shelflife.hq.dla.mil/508.aspx
5. LPS Laboratories, Shelf-Life, Warranty and Date of Manufacture: http://www.lpslabs.com/technical_info/LPS_warrantystmnt.pdf
6. Shelf Life Policy and Procedures: http://www.af.mil/shared/media/epubs/PUBS/AF/23/23011007/070301/070301.pdf

OSHA's Hexavalent Chromium Standard

By Philip Saunders, Chemical Engineer, HTIS

In recent years, there has been an increased awareness of the environmental and occupational safety and health risks associated with the use of, or exposure to compounds containing hexavalent chromium (Cr(VI)). These compounds are most often used in industrial settings including the production of stainless steel, and chromate-containing pigments and chemicals. Exposure to Cr(VI) can occur during metal working operations, such as welding, chemical plating and thermal cutting. Cr(VI) is believed to be a human carcinogen, and over-exposure can cause severe health problems in both the short and long terms. On February 28, 2006, the US Occupational Safety & Health Administration (OSHA) issued the final regulations for its Hexavalent Chromium Standard. This standard sets allowable exposure thresholds and requirements for activities such as exposure controls, exposure monitoring, medical surveillance, and employee training. This article discusses the health effects linked to Cr(VI) exposure, the requirements of OSHA's standard, and some of the relevant interpretations that have been issued regarding the standard.

Hexavalent chromium compounds (molecules containing chromium atoms capable of forming six electron bonds with other atoms) are used in a wide variety of applications. Such compounds are frequently used by the military services during maintenance activities such as chromate conversion coating applications and electroplating. They are also frequently used as a component in paints and primers since they can act as an anti-corrosive agent. In addition, other forms of chromium (such as trivalent chromium) may be oxidized to form Cr(VI) when they are exposed to high heat such as the heat encountered when performing welding, brazing, grinding or cutting operations involving chromium-containing metal alloys.

A trace amount of trivalent chromium is actually a biological necessity for the metabolism of sugars and fats; however, in large quantities or in other forms (such as hexavalent chromium), chromium becomes a toxin. Cr(VI) can have a variety of negative health effects depending on the routes of exposure, the exposure level and its duration or frequency. The most common routes of exposure in a workplace environment would be from inhalation (usually from airborne dusts or fumes), and contact with the eyes or skin (usually while handling chromium-containing solids or liquids). The immediate health effect of high level exposures is irritation of the respiratory tract (e.g. runny nose, sneezing, coughing, itching or burning of the nose, throat and lungs) if Cr(VI) is inhaled, or through contact with the eyes and skin.

If exposure to large amounts of Cr(VI) occurs repeatedly or for extended durations, then more severe health effects are seen. In the short term, inhalation of Cr(VI) can result in nasal sores and nosebleeds or, in more severe cases, perforation of the nasal septum (the wall separating the nasal passages). Cr(VI) is also a skin sensitizer that can cause allergic reactions in people who have become sensitized to it. This reaction is a condition called allergic contact dermatitis, and its symptoms include swelling and a rash. Prolonged exposure to a sensitized individual can cause the rash to become very dry and thickened. For non-sensitized individuals, direct contact with intact skin can cause irritation, but contact with non-intact skin can cause sores (called chrome ulcers) that leave scars after they heal.

Before OSHA issued its Hexavalent Chromium Standard in 2006, OSHA had a permissible exposure limit (PEL) of 52 micrograms per cubic meter ($\mu g/m^3$), but that value was reduced to 5 $\mu g/m^3$ for the purposes of the new standard. The PEL is based on an 8-hour time weighted average (TWA), so employees may be exposed to Cr(VI) concentrations exceeding the PEL concentration, as long as the average exposure over the course of an 8-hour work day does not exceed the PEL. The standard does include an exception for the aerospace industry which allows an exposure level of up to 25 $\mu g/m^3$ for employees involved in painting aircraft or large aircraft parts. OSHA does not define 'aerospace industry', but it likely includes aircraft maintenance and repair facilities in addition to facilities that produce aircraft.

The standard itself (found in 29 CFR 1910.1026) cannot be easily summarized, but there are several sections that are particularly important for determining if some (or all) of the standard applies, and if so, what it requires under particular circumstances.

Applicability of the Standard: The first paragraph of the standard, 1910.1026(a), provides the scope of the standard and describes situations where the standard does not apply. According to 1910.1026(a)(4), the standard does not apply when 'objective data' demonstrate that the expected conditions associated with work activity involving chromium (VI) cannot release dust, fumes or mists with chromium concentrations at or above 0.5 $\mu g/m^3$ based on an 8-hour TWA. The definition of 'objective data' in 1910.1026(b) refers to data previously collected from sources such as industry-wide surveys or are based on calculations, but the data must reflect workplace conditions resembling the conditions found in the workplace. The standard does apply if the 8-hour TWA expo-

sure can reasonably be expected to exceed the 0.5 µg/m^3 threshold.

Employee Monitoring: In 1910.1026(e), the standard describes the monitoring procedures for workplaces covered by the standard (when the TWA exposure is expected to exceed 0.5 µg/m^3). It requires employers to determine the 8-hour TWA for each employee who is exposed to Cr(VI). This determination can be made using a combination of sources, as long as they accurately characterize employee exposures, or employers can perform periodic monitoring by taking breathing zone air samples. Under the periodic monitoring option, the standard establishes an 'action level' (2.5 µg/m^3) above which periodic employee exposure monitoring must be performed at least every six months, but if the exposure exceeds the PEL, then monitoring must be performed every three months. If two readings from monitoring that occurred at least a week apart show that the employee's exposure is below the action level, or if exposure is below the 0.5 µg/m^3 threshold, then the periodic monitoring may be discontinued. However, additional monitoring may become necessary if any changes occur that could affect the exposure levels. These could include changes to the production processes, equipment, personnel or work practices.

Exposure Controls: In 1910.1026(f), the standard mandates the use of engineering and work practice controls as the primary method to ensure that employee exposures to Cr(VI) stay below the PEL unless such methods are demonstrated to be infeasible. Engineering controls usually mean the installation of hardware that actively prevents exposure, while work practice controls usually means the implementation of work-rules and procedures that reduce employee exposures. Engineering controls are usually the preferred method since the changes to work practices can be more easily ignored. If it can be demonstrated that such changes cannot feasibly reduce the exposure levels below the PEL, then the standard requires their use to reduce employee exposures to the lowest achievable level for respiratory protection to also be used. The main exception to this requirement is when no employee is exposed to Cr(VI) in excess of the PEL on 30 or more days per year. However, the standard also forbids rotating employees into different jobs to avoid being covered by this requirement.

Respiratory Protection: In 1910.1026(g), the standard does not specify the precise respiratory protective equipment to be used (it merely says that it must be 'appropriate'); but it does describe the situations when the use of respiratory protection is required or allowed as the primary method for ensuring employee exposure to Cr(VI) stays below the PEL. These situations include:

1. The period during which feasible engineering and work practice controls are being installed or implemented;

2. When maintenance activities are occurring, but where engineering and work practice controls are not feasible;

3. When all feasible engineering and work practice controls were insufficient to achieve compliance with the PEL;

4. When employees are exposed to chromium (VI) concentrations above the PEL for fewer than 30 days per year, but the employer has elected not to implement engineering or work practice controls (since they are not required by 1910.1026(f) if exposure exceeds the PEL for fewer than 30 days per year); or

5. In emergencies (defined as an uncontrolled release of chromium (VI) not including incidental releases that can be controlled at the time of release by employees in the immediate release area).

Protective Equipment: 1910.1026(h)(1) mandates that employers must provide protective clothing and equipment to employees (and ensure that it is used) when there is a hazard or potential hazard for skin or eye contact with chromium (VI). If a hazard evaluation of the workplace determines that there are no expected hazards from eye or skin contact, then the requirements of this paragraph do not apply, but there are no other exceptions. As with the respiratory protection requirements, the standard does not specify the exact equipment to use; it just states that the equipment must be 'appropriate'. However, OSHA has issued an interpretation that states that equipment is not 'appropriate' if an employee's street clothes can become contaminated during the work operation or when the protective equipment is removed. The remainder of 1910.1026(h) focuses on the care, maintenance, cleaning, storage, and replacement requirements for such equipment.

Medical Surveillance: 1910.1026(k)(1) describes when medical surveillance of employees is required. According to this paragraph, medical surveillance is only required for employees under the following circumstances:

1. If they are occupationally exposed to Cr(VI) above the action level (2.5 µg/m^3) for 30 or more days per year;

2. If they are experiencing signs or symptoms of the adverse health effects associated with Cr(VI) exposure; or,

3. If they were exposed during an emergency (an uncontrolled release, as described above).

The remainder of this paragraph describes the frequency with which medical examinations must be performed for those who meet these criteria, what the exam should consist of, and the information that should be provided to and/or by the examining physician.

In addition to the above requirements, there are other sections

of the standard that cover requirements for establishing restricted areas for working with Cr(VI) (1910.1026(e)), change rooms and washing facilities (1910.1026(i)), housekeeping (1910.1026(j)), employee training (1910.1026(l)), and record keeping (1910.1026 (m)). It is important that every person who works with or might otherwise be exposed to Cr(VI) should have a thorough understanding of the requirements of the standard. They should also be aware of the risks associated with Cr(VI), and know what symptoms they should be looking for in the event that they are exposed (either knowingly or unknowingly). If employees understand the risks they face, then they are likely to be less complacent and more vigilant when it comes to actively preventing accidental exposures.

References:

1. US Department of Labor, 'OSHA Issues Final Standard on Hexavalent Chromium', February 27, 2006, http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=12038

2. US Department of Labor, Occupational Safety & Health Administration, 'Hexavalent Chromium', http://www.osha.gov/SLTC/hexavalentchromium/index.html

3. OSHA Fact Sheet: "Health Effects of Hexavalent Chromium", July 2006, http://www.osha.gov/OshDoc/data_General_Facts/hexavalent_chromium.pdf

4. 29 CFR 1910.1026, Chromium (VI) Standard.

5. OSHA Letter of Interpretation: "Clarification of the Chromium (VI) Standard - Change Rooms and Hygiene Practices", September 2, 2011.

Other News

New Law Prohibits the — International Mailing of Lithium Batteries via the United States Postal Service

By Abdul H. Khalid, Chemical Engineer, HTIS

On May 14, 2012, the U.S. Postal Service (USPS) revised its Mailing Standards: the Domestic Mail Manual (DMM) 601.10.20, and the International Manual (IMM) part 136 - to prohibit the international (i.e., outbound) mailing of lithium batteries and devices containing lithium batteries. The USPS took this action to bring its international mailing standards into compliance with the international standards for the acceptance of dangerous goods in international mail.

This prohibition also extends to the mailing of lithium batteries to and from an APO, FPO, or DPO location. However, this prohibition does not apply to lithium batteries authorized under DMM 601.10.20, when mailed within the United States or its territories. This outbound international mailing prohibition applies to batteries containing lithium metal or lithium-ion cells regardless of quantity, size, watt hours, whether the cells or batteries are packed in, with, or without equipment. The final rule became effective on May 16, 2012.

The International Civil Aviation Organization (ICAO) and the Universal Postal Union (UPU) have had numerous discussions on lithium chemistry batteries with respect to international standards. The USPS anticipates that "on January 1, 2013, customers will be able to mail specific quantities of lithium batteries internationally (including to and from an APO, FPO, or DPO location) when the batteries are properly installed in the personal electronic devices they are intended to operate. Until such time, when a less restrictive policy can be implemented consistent with international standards, and in accordance with UPU, lithium batteries are not permitted in international mail".

The UPU convention and regulations are consistent with the ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air (Technical Instructions). The Technical Instructions concerning the Transport of Dangerous Goods by Post do not permit "dangerous goods" as defined by the ICAO Technical Instructions in international mail. As indicated in the final rule, electronics devices such as cell phones, smartphones, portable gaming devices, and MP3 players containing lithium batteries are also prohibited.

The prohibition will be incorporated in the mailing Standards of the U.S. Postal Service Domestic Mail Manual 601.10.20, and in addition, amendments to 39 CFR Part 111 will be published to reflect the changes.

DoD shipping and packaging personnel should check private carriers (e.g., FedEx, UPS and DHL) for their lithium batteries policies. They may accept lithium batteries and devices containing lithium batteries for international shipment under specific packaging requirements. Private carriers have their own policies for international mailing of lithium batteries and devices containing lithium batteries.

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References:

1. Federal Register, Vol. 77, No. 93, May 14, 2012, website at: http://www.gpo.gov/fdsys/pkg/FR-2012-05-14/pdf/2012-11459.pdf.;

2. U.S. Postal Service- Publication 52 Revision: Lithium Battery — Update, website at:

http://about.usps.com/postal-bulletin/2012/pb22336/html/updt_012.htm; and,

3. Mailing Standards of the United States Postal Service, International Mail Manual (IMM) http://about.usps.com/postal-bulletin/2012/pb22336/html/updt_010.htm

ECHA Releases its Current — **Chemical Substances Classification and Labeling Inventory**

By Abdul H. Khalid, Chemical Engineer, HTIS

In February 2012, the European Chemical Agency (ECHA) released its current Public Classification and Labeling (C&L) Inventory. The ECHA has the same task as that of the U.S. Occupational Safety and Health Administration (OSHA), and that is, to keep workers and their work environments safe from chemicals or other hazards. The Registration, Evaluation, Authorization, and Restriction of chemicals (REACH) and the Classification, Labeling and Packaging of Substances and Mixtures (CLP) Regulations require that chemical companies submit to ECHA key information about the substances which they manufacture, import or (in some cases) use. ECHA receives this information in compliance with REACH registration and CLP notifications.

The inventory includes information on the hazard properties of a substance available in the European Union's market, its classification and labeling, as well as an assessment of the potential risk presented by it. Chemical companies/manufacturers submit the necessary data to an ECHA centralized database that makes this information available to the European Union's Member States' Competent Authorities and Enforcement Authorities. In addition to the above cited information, the centralized database contains a list of substances that are categorized as having harmonized classification and labeling in accordance with Annex VI of the CLP regulation.

ECHA does make certain elements of the Classification and Labeling (C&L) Inventory accessible to the public (i.e., the Public C and L inventory). Currently, over three million submission records covering more than 90,000 chemical substances are freely accessible from the ECHA website.

The Public C&L Inventory represents the largest database of self-classified substances available globally. A number of options are available for searching the Inventory, based on both the substance identity and its classification. Future updates of the Inventory will continuously improve the search functions in order to enhance access to the information. ECHA maintains the inventory, and the data will be refreshed on a regular basis with incoming and updated C&L information.

The following information is not included in the public C&L inventory:

- Contact details of the notifier; and,
- The composition and impurity profile of the substances.

The publication of the Inventory is a key milestone set out in the CLP Regulation, and represents a significant step forward towards transparency on the physical, health or environmental hazards of chemical substances. The Inventory provides a wealth of information from the Chemical Industry on how it has self-classified chemicals, and shows how some companies have classified the same substance differently. ECHA has not filtered or quality checked the information provided.

"With this increased transparency, we are contributing to a more effective communication on the hazardous chemicals to workers and ultimately to consumers" said Geert Dancet, Executive Director of the European Chemicals Agency. He also encouraged Industry to use the Inventory data as a common ground for discussions between companies to reach agreement on the self-classification and labeling of hazardous substances. To provide support for the hazard communication process, ECHA is planning to develop an Information Technology platform to facilitate contacts among notifiers of chemicals, thereby providing them with the opportunity to discuss the reasons for the differences and, where appropriate, agree on a uniform classification.

References:

1. ECHA launches the Classification and Labeling Inventory of chemicals on the EU market, Press Release, February 13, 2012, Website at: http://echa.europa.eu/web/guest/home;

2. C&L Inventory Database at: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database;

3. Understanding CLP at: http://echa.europa.eu/web/guest/regulations/clp/understanding-clp; and,

4. Classification and labeling Inventory at: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory.

HTIS BULLETIN WILL TRANSITION TO AN ALL ELECTRONIC EDITION

With the (Jan-Mar2013) edition of the BULLETIN, we will no longer publish the bulletin in the hard copy format which you are currently receiving. We have thought long and hard about this decision, and concluded that the expense and time as well as the diminishing number of printing companies available to produce the hard copy version necessitates that we move to the electronic medium of delivery.

If you currently receive the BULLETIN in hard copy, please send your official/work site e-mail address to Mr. Leonard Lambert (leonard.lambert@dla.mil) thereby enabling you to continue to receive the BULLETIN while conserving resources. Receipt of the HTIS BULLETIN will allow you to electronically transmit either all or selected BULLETIN articles of interest to your colleagues. No ones' e-mail address will be visible to any electronic recipient. Thank you for your continued interest in and for being a loyal reader of the HTIS Bulletin.

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