Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

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Guidance on Quantifying Use and Reporting Cyanide Compounds under the Toxics Use Reduction Act

As of reporting year 2016, Cyanide Compounds (TURA chemical category # 1016) has been designated as a Higher Hazard Substance (HHS), lowering the reporting threshold to 1,000 pounds. The new threshold will apply to cyanide compounds use in calendar year 2016, which will be reported on Form S reports due July 1, 2017. This document provides guidance on determining if activities at your facility are likely to trip the reporting thresholds and how cyanide use is reported in compliance with the Toxics Use Reduction Act, including how cyanide use is reported on Form S.

Definition of the Category

Cyanide compounds include any chemical substance with the chemical formula: $X^+ CN^-$ where $X = H^+$ or any other group where a formal dissociation can be made. Examples include potassium cyanide (KCN) and calcium cyanide ($Ca(CN)_2$). Consistent with the TRI cyanide category (#N106) definition, hydrogen cyanide and ethyl cyanide are reported as individual chemicals, and are not included in the category. They are reported under their individual CAS numbers.

Reporting Thresholds

For use during calendar year 2015, continue to observe the reporting thresholds of 25,000 pounds for cyanide compounds manufactured or processed and 10,000 pounds for cyanide compounds otherwise used. For use during calendar year 2016, the thresholds will be 1,000 pounds for each of these, for reporting on Form S under TURA, but will remain unchanged for federal TRI reporting on Form R. Note that these three types of use are NOT additive for the purposes of determining whether the threshold has been exceeded. For example, a facility that manufactured 700 pounds and otherwise used 350 pounds of cyanide compounds would not be required to submit a Form S report on the substance, since neither type of use exceeded 1,000 pounds. However, if more than one cyanide compound was used for the same type of use then those quantities would be additive (e.g. processing 700 pounds of zinc cyanide and processing 400 pounds of copper cyanide trips the 1,000 pound threshold).

Because the federal and state thresholds for cyanide compounds are different, a “State-Only Form R” is submitted to the state along with the Form S when use exceeds the lower state TURA reporting threshold. The TURA eDEP system will automatically generate State Only Form Rs for these situations. Submit a separate Form R to the EPA TRI program when federal thresholds are exceeded.

Report What Enters, Leaves and is Manufactured During Processing

For reporting on Form S, report not only on what enters and leaves the process, but also on what is manufactured within the process. Compounds leaving the production process/unit must be counted as byproduct before entering a wastewater treatment process.

Common Uses of Cyanide Compounds

Cyanide compounds are primarily used in Massachusetts for electroplating and stripping of metallic surfaces. Other possible uses of cyanide compounds include the extraction and refining of precious metals and the synthesis of nitrogen-containing organic chemicals.

Common Forms of Cyanide Compounds

Common cyanide compounds include cyanide salts of: sodium, potassium, calcium, iron, zinc, copper, silver, cadmium, and gold. The anhydrous salts may be used directly with water to make plating baths which can be augmented with pure metal anodes. Sometimes a concentrated gold cyanide solution is used directly in plating baths rather than handling the more expensive pure metal form.

Often when plating a metal onto another metal product surface, an aqueous solution of the metal cyanide, sodium or potassium cyanide, and non-cyanide additives are used. Sometimes metal cyanide solution is added to the bath as the metal is plated out, especially with precious metals such as gold. More often the desired metal concentration of the solution is maintained by continuously dissolving the pure metal from the anode. Over time contaminants accumulate in the solution and cause inferior plating results. In this case the plating bath may be dumped for disposal or reclamation.

Cyanide Compound Example: Electroplating

A **300 gallon** copper plating tank operates with **1,000 Liters of solution**. A fresh solution is made up at the beginning of the calendar year with **60 kilograms of Copper Cyanide and 94 kilograms of Sodium Cyanide**.

Over the course of the year, **323 kilograms** of copper are consumed from the anode, creating **455 kg of copper cyanide** as **323 kilograms** of copper are plated from the solution onto steel parts. Also, **25 Kg of Cyanide salts** have been added to maintain tank concentrations due to drag out losses.

At the end of the year the plating bath has accumulated contaminants and needs replacement.

Data for Byproduct Cyanide Compounds = 179 kg x 2.20 = 394 lbs.

Data for Form S, Section 1: Facility-Wide Use of Listed Chemical (Cyanide Compounds

c. Manufactured	*1,001 pounds of Copper Cyanide* *(455 kg x (2.20 lb/kg)*
d. Processed	*132 pounds of Copper Cyanide* *(60 kg x (2.20 lb/kg)* *When a given listed substance is introduced into production anywhere at the facility, it is counted only once at the facility level, regardless of how many times that listed substance is used, recycled or reused onsite. It is reported under the category that first trips the reporting threshold. Therefore, the 1,001 pounds of copper cyanide that was manufactured is reported as "manufactured". It is not included in the "processed" total because it was already reported as manufactured.* *(However, the total amount (1,133 pounds) manufactured and processed IS included in the production unit level reporting, and in the reported use range code .*
e. Otherwise used	*262 pounds of Sodium Cyanide* *(94 kg + 25 kg) = 119 kg x (2.20 lb/kg)*
f. Byproduct	*394 pounds CuCN and NaCN* *(179 kg x (2.20 lb/kg)*
g. Shipped as Product	*0 pounds*

Form S, Section 2: Materials Balance

[NOTE: Atomic Weight of Copper is 63.546 and Molecular Weight of Cuprous Cyanide is 89.563 Molecular weight of Sodium Cyanide is 49.007]

RELEVANT REFERENCES

Background Document, Designation of Cyanide Compounds
TURI Summary of Policy Analysis for Cyanide Compounds, Aug. 12, 2014
http://www.turi.org/content/download/9405/164669/file/Policy%20analysis%20cyanide%20compounds%20-%20August%202014.pdf

Massachusetts Chemical Fact Sheet for Cyanide Compounds
http://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/Cyanide_and_Cyanide_Compounds/Cyanide_and_Cyanide_Compounds_Fact_Sheet

1998 EPCRA Section 313 Questions and Answers
Question Numbers 137, 138, 111, 416
http://www.epa.gov/sites/production/files/2015-05/documents/qas_1998.pdf

Electroplating Engineering Handbook by Lawrence J. Durney, Van Nostrand Reinhold Company, 1984

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https://www3.epa.gov/tri/training/data/Ry15advanced/presentation_content/external_files/advanced_transcript.html

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