

Regulated Metals: The Rule of 20

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How does your company determine if a waste is hazardous? In many situations you will need to have a representative sample of a particular waste analyzed to adequately determine whether or not it is hazardous. KDHE requires that generators use a state-certified laboratory to analyze their waste. However, “knowledge of the process” generating the waste can also be used to make a determination. If you use knowledge of the process to make a hazardous waste determination, you should document your reasoning or approach and keep supporting documentation in your environmental folder so the information is readily available during an inspection. Environmental inspections conducted by the Kansas Department of Health and Environment (KDHE), the Environmental Protection Agency (EPA), or safety inspections by the Occupational Health and Safety Agency (OSHA) are almost always unannounced inspections. Well-organized and readily accessible records go a long way toward a successful inspection.

The Total Waste Analysis

The “total” waste analysis actually determines the total concentration of a contaminant present in a sample. This analysis can be useful when determining unknown chemicals in a waste stream and/or determining their concentrations. It can be used as a screening tool during a hazardous waste determination and may eliminate the need for additional testing in some cases.

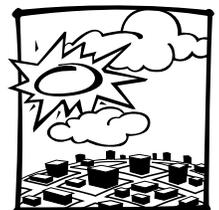
Toxicity Characteristic Wastes

A waste material has the characteristic of “toxicity” if it is able to leach specific toxic metals, organic compounds, or pesticides into the soil or groundwater

under landfill conditions. A special test called the toxicity characteristic leaching procedure (TCLP) is used to determine if a waste material will leach these chemicals into the soil or groundwater.

The TCLP Test

The TCLP test is a complicated leaching procedure that simulates conditions of wastes if they were to be disposed of in an ordinary sanitary landfill. Waste samples vary widely and may be completely solid or completely liquid, or contain both liquids and solids, such as sludge samples. If a waste contains less than 0.5% solids, only the filtered liquid needs to be tested and the complex leaching procedure doesn't need to be performed. A sample composed of both liquid and solid materials must be filtered to separate any liquid. The liquid portion is saved for further testing. The remaining solid sample is then mixed with a slightly acidic extraction liquid equal to 20 times the weight of the original sample being tested. This sample and the extraction fluid are then placed into a tumbler and mixed for at least 18 hours. This tumbling simulates the leaching action of water seeping through waste in a landfill. After tumbling, the sample/extraction fluid mixture is filtered to separate the solid material from the extraction fluid. The solid portion is discarded. The remaining extraction fluid is then combined with any liquid filtered from the original sample. The combined liquid sample is then analyzed using specific analytical procedures for various metals and chemical compounds. The concentrations of each constituent are reported, usually in milligrams per liter (mg/l), which equals parts per million (ppm). If



the concentration of that constituent is greater than the TCLP limit, the waste is a “toxicity characteristic” hazardous waste.

“Rule of 20”

As mentioned above in the TCLP procedure, the original test sample of a solid material is mixed or diluted with a volume of extraction fluid that equals 20 times the weight of the sample. A sample should weigh at least 100 grams. If *all* of a constituent in the sample completely dissolved or leached into the extraction fluid during the tumbling cycle, then the concentration of the constituent in the extraction fluid will always be 20 times less than its original concentration in the sample, because it is diluted to 1/20th of its original concentration. For example, an original 100 gram soil sample contains a total concentration of 200 ppm lead. The soil sample is diluted with 20 times as much extraction fluid. The sample is tumbled and filtered, and the extraction fluid is analyzed. If all of the lead in the sample dissolved in the extraction fluid, the concentration of lead in the extraction fluid would be 1/20 of 200ppm or 10ppm lead.

This required 20:1 dilution ratio of the extraction fluid to the sample allows generators to use another option to determine if a waste is hazardous, using the total waste analysis result and the “Rule of 20” concept from the TCLP procedure. Here’s how it works:

The total concentration results can be divided by 20 and compared to the regulatory concentrations on the TCLP list. If the result is less than the TCLP regulatory limit (for each respective TCLP constituent of concern) then the waste is not a “toxicity characteristic” hazardous waste. Or, if the total concentration of a chemical is less than 20 *times* the TCLP regulatory limit, then the sample cannot leach enough of that constituent to fail the TCLP limit, even if all the chemical dissolved into the extraction fluid. This works because the total analysis represents the total amount of chemical present in the sample and if the

total concentration is less than 20 times the TCLP regulatory limit of that constituent, then the sample could not possibly “leach” enough of the chemical under TCLP conditions to fail the TCLP limit even if all the chemical dissolved into the extraction fluid.

Metal	TCLP Limit	20 x TCLP limit
Arsenic	5.0	100
Barium	100	2000
Cadmium	1.0	20
Chromium	5.0	100
Lead	5.0	100
Mercury	0.2	4
Selenium	1.0	20
Silver	5.0	100

NOTE: If your total analysis results are equal to *more than* 20 times the TCLP limits the waste *may* be a hazardous waste and should be handled as such until further testing, using the TCLP analysis, confirms the waste’s toxicity characteristic results.

Although prices may vary from lab to lab, a “total waste analysis” for metals or organics is cheaper than a TCLP test because of the simplified testing procedure of the total analysis. If in doubt about what test is needed for your waste stream, call one of the state-certified labs listed in KDHE’s *Hazardous Waste Generator Handbook* or call the Pollution Prevention Institute for assistance at 800-578-8898. A list of the TCLP constituents, their respective regulatory levels, and state-certified labs are in the handbook referenced above (available at http://www.kdhe.state.ks.us/waste/apps-hw/HW_Gen_Hndbk_2000.pdf).

Resources

<http://gcisolutions.com/HWFFN0593.htm> (decision tree for test choice)

<http://www.encolabs.com/tclpnote.htm> (explains the concept behind the Rule of 20)

<http://www.kdhe.state.ks.us/labs/download.html> (list of certified labs by KDHE Division of Laboratories, go to “Labs Approved for Environmental Testing” link)



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