

# Guidance on Cleanup and Disposal of UV/EB-Curing Waste Materials

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## Introduction

RadTech compiled this document to help users and converters of UV/EB raw materials and formulated products ensure that proper waste cleanup and disposal considerations are taken into account.<sup>1</sup> Compliance with government and agency guidelines and regulations helps to protect the environment from unnecessary releases and is required to avoid fines, penalties or other legal action. Use of proper Personal Protective Equipment (PPE) and recommended guidelines for waste handling and disposal minimizes exposure risks to workers and the community.



The following review summarizes the potential sources of wastes that can be generated over the entire life cycle for manufacture and use of UV/EB curing coatings and adhesives, including the production of raw materials (resins, monomers, additives), and formulating and converting UV/EB-curing materials into finished products. The summary includes typical guidelines for industrial waste handling and disposal practices and references to applicable regulations.

## Typical Wastes That Can Be Generated in UV/EB-Curing Materials Manufacture, Formulation and Use

### Waste Raw Materials and Formulated Products

- Unused or off-spec monomers, oligomers, photoinitiators, additives, solvents, etc.
- Unused or off-spec formulated products (inks, coatings, adhesives, encapsulants, etc.)
- Product sampling waste
- Used filter media and filter residues
- Unused or over-aged/off-spec solvents or chemicals
- Empty containers

### Cleanup Wastes

- Equipment start-up, cleaning and flushing wastes
- Spent cleaning solvents
- Contaminated wastewater from cleaning
- Used shop rags

- Spill cleanup residues and, in some spill cases, contaminated soil and/or wastewater

Waste from cleanup will vary by industry and application. For estimating equipment cleanup wastes, EPA models assume from 0.07% to a maximum of 0.2% residue in equipment for pumping materials from a process vessel, 0.2% for gravity-draining materials from a process vessel and up to 2% residual in draining an interconnected system of multiple process vessels.<sup>2</sup> See Table 1 for container residue estimates.

In general, operating and maintenance instructions from equipment manufacturers and Material Safety Data Sheets (MSDS) from suppliers of raw materials and formulated products provide specific cleanup recommendations. When these are not available, RadTech has published guidelines on safe handling of UV/EB materials which may provide useful guidance [http://www.radtech.org/health\\_safety/index.htm](http://www.radtech.org/health_safety/index.htm).

Recommended cleanup solutions will vary by industry, application and equipment being used. Care must be taken to prevent damage to equipment and ensure minimal downtime. While solvents can be efficient cleaners, their use requires attention to and compliance with federal, state and local regulations. Many cleaning solutions contain volatile organic compounds (VOCs) and/or hazardous air pollutants (HAPs) and can pose issues with environmental releases, flammability or exposure concerns for workers. If solvents are required, use of materials with the highest flashpoints and least hazardous health rating are preferred.

Regional differences in regulations may exist for required use of low-VOC cleaners and, in some cases, may give preference to UV/EB-curing materials (in California, for example). Most solvent-containing cleanup residues must be treated as hazardous waste.

In some instances, aqueous cleaners can be used, though care must be taken when disposing of used cleanup solutions to assure compliance with federal and local water discharge regulations.

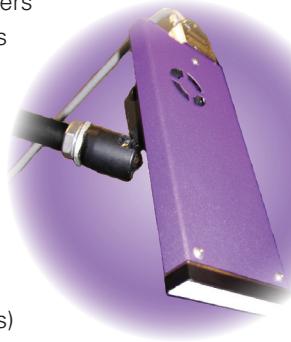
If a spill results in contaminated soil, check with local regulations to assure means of proper disposal.

## Most UV/EB Wastes Are Not Hazardous Under EPA Definitions<sup>3</sup>

Typical UV/EB curing formulations include the following components:

### Acrylate Free-Radical Formulations

- Acrylate Oligomers and Monomers and Amino Acrylate Co-Catalysts
- Inhibitors
- Free-Radical Photoinitiators
- Additives (for adhesion, flow, surface properties, gloss control, etc.)
- Pigments (in some cases)
- Organic Solvents (in some cases)



"Corrosivity" criteria or "Toxicity" characteristic (see page 3 for more detailed definitions). However, some formulations containing toxic components (such as certain solvents, iodine, antimony or arsenic-based photoinitiators or heavy metal pigments) may be identifiable as "toxic."

While most UV/EB formulations do not meet the "reactivity" characteristic, a few pure monomers that comprise mostly very highly functional acrylates (such as PETA, DiPETA, DiTMPTA, etc.) have been known to react in bulk with the evolution of heat and fumes. Formulations that contain very high concentrations of such monomers should be evaluated to determine whether they meet the "reactivity" criteria. If in doubt, they should be disposed of as potentially "reactive" wastes.

Even though a solid waste<sup>4</sup> is not a listed or characteristic waste (see "EPA Definitions of Hazardous Wastes" below), it could become a hazardous waste if mixed with materials classified as hazardous (see "Mixtures" section on page 3.)

Spent UV and fluorescent lamps from converting operations, batteries and mercury-containing items (and pesticides) are regulated as "*Universal Wastes*" (See "*Derived From Wastes*" on page 3).

### Universal Wastes

- Spent UV and fluorescent lamps and other mercury-containing items
- Batteries
- Electronics waste

## EPA Definitions of Hazardous Wastes (40 CFR 261.3)

If a waste is considered solid waste, it must then be determined if it is hazardous waste (*40 CFR 262.11*). Wastes are defined as hazardous by the EPA if they are specifically named on one of four lists of hazardous wastes located in Subpart D of *40 CFR*

*261* (F, K, P, U) or if they exhibit one of four characteristics located in Subpart C of *40 CFR 261* (characteristic wastes):

- **The F-list** (non-specific source wastes)—This list identifies wastes from common manufacturing and industrial processes,

such as spent solvents that have been used in cleaning or degreasing operations. Because the processes producing these wastes can occur in different sectors of industry, the F-listed wastes are known as wastes from non-specific sources. Wastes included on the F-list can be found in the regulations at *40 CFR 261.31*.

- **The K-list** (source-specific wastes)—This list includes certain wastes from specific industries, such as petroleum refining or pesticide manufacturing. Certain sludges and wastewaters from treatment and production processes in these industries are examples of source-specific wastes. Wastes included on the K-list can be found in the regulations at *40 CFR 261.32*.
- **The P-list and the U-list** (discarded commercial chemical products)—These lists include specific commercial chemical products in an unused form. Some pesticides and some pharmaceutical products become hazardous waste when discarded. Wastes included on the P- and U-lists can be found in the regulations at *40 CFR 261.33*.

For further identification of P-list and U-list chemicals, consult the Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(r) of the Clean Air Act (List of Lists), which contains codes for specific chemicals and can be found at <http://www.epa.gov/ceppo/pubs/title3.pdf>.

Wastes that have not been specifically identified by the EPA on any list may still be considered a hazardous waste if they exhibit one of the four characteristics defined in *40 CFR Part 261 Subpart C* - ignitability (D001), corrosivity (D002), reactivity (D003) and toxicity (D004 - D043).

- **Ignitability**—Ignitable wastes can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F). Examples include waste oils and used solvents. For more details, see *40 CFR §261.21*. Test methods that may be used to determine ignitability include the *Pensky-Martens Closed-Cup Method for Determining Ignitability (Method 1010A)* (PDF) (1 pg, 19K) , the *Setaflash Closed-Cup Method for Determining Ignitability (Method 1020B)* (PDF) (1 pg, 17K) , and the *Ignitability of Solids (Method 1030)* (PDF) (13 pp, 116K).
- **Corrosivity**—Corrosive wastes are acids or bases (pH less than or equal to 2, or greater than or equal to 12.5) that are capable of corroding metal containers, such as storage tanks, drums and barrels. Battery acid is an example. For more



details, see *40 CFR § 261.22*. The test method that may be used to determine corrosivity is the *Corrosivity Towards Steel (Method 1110A)* (PDF) (6 pp, 37K).

- **Reactivity**—Reactive wastes are unstable under “normal” conditions. They can cause explosions, toxic fumes, gases or vapors when heated, compressed or mixed with water. Examples include lithium-sulfur batteries and explosives. For more details, see *40 CFR §261.23*. There are currently no test methods available.
- **Toxicity**—Toxic wastes are harmful or fatal when ingested or absorbed (e.g., containing specifically listed chemicals, such as mercury, lead, etc.). When toxic wastes are land disposed, contaminated liquid may leach from the waste and pollute ground water. Toxicity is defined through a laboratory procedure called the *Toxicity Characteristic Leaching Procedure (TCLP) (Method 1311)* (PDF) (35 pp, 288K). The TCLP helps identify wastes likely to leach concentrations of contaminants that may be harmful to human health or the environment. For more details, see *40 CFR §261.24*.

## Mixtures

Even though a solid waste is not a listed or characteristic waste, it could become a hazardous waste if mixed with materials classified as hazardous. The “Mixture Rule” states that mixtures of solid waste and listed hazardous waste must be regulated as hazardous waste. There are two ways to determine if a material is regulated under the mixture rule:

1. If the material is a mixture of a solid waste and a hazardous waste, and the mixture exhibits one or more of the characteristics of hazardous waste;
2. If the material is a mixture of a solid waste and a listed waste. More information can be found at *40 CFR 261.3(a)(iii)* and (iv).

## “Derived From” Wastes

The “derived-from” rule governs the regulatory status of certain waste residues.<sup>5</sup> “Derived from” wastes include sludges; solvent and chemical-contaminated rags and filter media; spill residues; soil contaminated by spills; drums, pails or bags that have been used for storage of a hazardous waste; ash from the incineration of hazardous waste; emission control dust; and leachate. This principle applies regardless of the actual risk to human or environmental health. More details about the “derived from” rule and exemptions to the rule are included in *40 CFR Part 261.3 (c) and (d)*.

The EPA default guideline for filtration losses is of 0.01 kg chemical adhered/kg chemical processed for clear, unpigmented radiation-curable product. If pigments are present in the product (e.g., ink formulations), a default filter loss fraction of 0.04 kg chemical adhered/kg chemical processed should be used.<sup>6</sup>

## Wastewater

Wastewater from production, cleanup operations or water contaminated by spills may be prohibited from direct discharge to sewers without pretreatment and/or a permit. However, the EPA data indicate that less than one percent of all waste generated at radiation-curable product formulation and converting sites is discharged to water, so on-site wastewater treatment typically is not required. Resin and monomer production facilities that do discharge process wastes to water in some cases may need to pretreat their process wastewaters.

The Clean Water Act (CWA) makes it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit has been obtained. The EPA's *National Pollutant Discharge Elimination System (NPDES)* permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal and other facilities must obtain permits if their discharges go directly to surface waters. Discharge of contaminated wastewaters to a publicly operated



treatment works (POTW) (e.g., by pouring it down a drain that leads to a sewer leading to a POTW) must be in full compliance with an issued permit. Any on-site treatment or pretreatment of contaminated wastewater before discharge to a POTW must be covered by a permit. Contaminated wastewaters that are not covered by these options must be disposed of in accordance with applicable waste regulations.

*De minimis* losses of characteristic wastes to wastewaters are not considered to be prohibited wastes and are defined as losses from normal material handling operations (e.g., spills from the unloading or transfer of materials from bins or other containers, leaks from pipes, valves or other devices used to transfer materials); minor leaks of process equipment, storage tanks or containers; leaks from well-maintained pump packings and seals; sample purgings; relief device discharges; discharges from safety showers and rinsing and cleaning of personal safety equipment; rinsate from empty containers or from containers that are rendered empty by that rinsing; and laboratory wastes not exceeding one percent of the total flow of wastewater into the facility's headworks on an annual basis, or with a combined annualized average concentration not exceeding one part per million in the headworks of the facility's wastewater treatment or pretreatment facility.

Check with your local POTW before discharge if there is any question about potentially hazardous contaminants in wastewater or site runoff that may require a discharge permit.

## Disposal Of Empty Containers (40 CFR 261.7)

"Empty" totes, drums, pails, bags or inner liners may be disposed of by recycling, in landfills or, for plastic or paperboard, by combustion for energy recovery. Some container recyclers have indicated reluctance to accept empty drums or pails that contained UV/EB-curing materials if they still contain any residue that does not dry by evaporation.

The following points address EPA definitions and regulations that apply to empty containers intended for landfill disposal, energy recovery or recycling.

### Definition Of Empty

A container or an inner liner removed from a container that has held any hazardous waste, except a waste that is a compressed gas or that is identified as an acute hazardous waste is empty if:

- i. All wastes have been removed that can be removed using the practices commonly employed to remove materials from that type of container (e.g., pouring, pumping and aspirating), and

- ii. No more than 2.5 centimeters (one inch) of residue remain on the bottom of the container or inner liner, or no more than 3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is less than or equal to 119 gallons in size; or
- iii. No more than 0.3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is greater than 119 gallons in size.

A container that has held a hazardous waste that is a compressed gas is empty when the pressure in the container approaches atmospheric.



A container or an inner liner removed from a container that has held an acute hazardous waste listed in §§261.31, 261.32, or 261.33(e) is empty if:

- i. The container or inner liner has been triple rinsed using a solvent capable of removing the commercial chemical product or manufacturing chemical intermediate;
- ii. The container or inner liner has been cleaned by another method that has been shown in the scientific literature or

by tests conducted by the generator to achieve equivalent removal; or

- iii. In the case of a container, the inner liner that prevented contact of the commercial chemical product or manufacturing chemical intermediate with the container has been removed.

For more detailed calculation of expected container residues, the values in Table 1 can be used.

**Table 1. EPA Standard Default Values for Use in Container Residual Calculations<sup>7</sup>**

Chemical Form	Container Type	Container Size (gallons)	Default Container Residue
Liquids	Bottle	Typical: 1 Range: <5	Central Tendency: 0.3 % High End: 0.6 %
	Small Container	Typical: 5 Range: 5 to <20	
	Drum	Typical: 55 Range: 20 to <100	Central Tendency: 2.5% High End: 3% (for pumping liquid out of the drum) Alternative defaults (for pouring liquid out of the drum) Central Tendency: 0.3% High End: 0.6%
	Tote	Typical: 550 Range: 100 to <1,000	Central Tendency: 0.07% High End: 0.2%
	Tank Truck	Typical: 5,000 Range: 1,000 to <10,000	
	Rail Car	Typical: 20,000 Range: 10,000 and up	
Solids	Any	Any	1%

## Other Types of Wastes To Be Considered

### Universal Wastes

"Universal wastes" include UV and fluorescent lamps, batteries, mercury-containing items and pesticides.

The federal universal waste regulations can be found in 40 CFR part 273. States can modify the universal waste rule and add additional universal waste(s) in individual state regulations, so check with your state for the exact regulations that apply locally. <http://www.epa.gov/osw/wyl/stateprograms.htm>.

RadTech members can access a white paper on the handling and disposal of UV lamps at <http://radtechintl.org/Content/Documents/Document.ashx?DocId=48691>.



### Electronics Wastes

Some electronics (such as color CRT computer monitors, color CRT TV tubes and smaller items such as cell phones and other handheld devices) test "hazardous" under federal law. If so, they are subject to special handling requirements, subject to certain exemptions. Regulations and standards concerning the disposal and recycling of electronics waste can be found at <http://www.epa.gov/epawaste/conserve/materials/ecycling/rules.htm>.

The EPA encourages reuse and recycling of used electronics. Basic information about recycling electronics can be found at <http://www.epa.gov/epawaste/conserve/materials/ecycling/index.htm>.

# Hazardous Waste Recycling And Recovery

Some hazardous wastes, such as waste solvents and metals, can be recovered for reuse. The EPA has promulgated extensive rules and regulations for storage, on-site recovery and off-site recycling of solvents and hazardous wastes. See the EPA web

page "Hazardous Waste Recycling" at <http://www.epa.gov/osw/hazard/recycling/index.htm> for guidance on recommended practices, procedures and applicable regulations.

## EPA Hazardous Waste Generators And Responsibilities<sup>8</sup>

The EPA defines three classes of hazardous waste generators, based on the quantity of hazardous wastes generated:

- Conditionally Exempt Small Quantity Generators (CESQGs)
- Small Quantity Generators (SQGs)
- Large Quantity Generators (LQGs)

Since quantity determines which regulations apply, it is essential that each site that generates wastes determines its waste generator class. There are different requirements for waste accumulation quantities and time limits, reporting, personnel training, contingency plans and emergency procedures, depending on the waste generator classification. The following table taken from the RCRA Training Module: *Introduction to Generators* (PDF) provides a summary of requirements for each class of hazardous waste generator. For a more detailed analysis, see *Hazardous Waste Generator Regulations: A User-Friendly Reference Document, May 2007* (PDF).

*The waste generator has sole responsibility for determining if a waste is a RCRA hazardous waste. (See: 40 CFR 262.11). Four questions must be considered to determine whether the waste is hazardous:*

1. Is the material a solid waste? (See: 40 CFR 261.2)
2. Is the waste specifically excluded from RCRA? (See: 40 CFR 261.4)
3. Is the waste a listed hazardous waste? (See: 40 CFR 261.30)
4. Does the waste exhibit a characteristic of hazardous waste? (See: 40 CFR 261.20)

### EPA Hazardous Waste Generator Identification Number

If your operations meet the criteria of any class of hazardous waste generator, they will need an EPA hazardous waste generator identification number. This is a unique number assigned to facilities that generate specified amounts of hazardous waste. If you generate more than 220 lbs (100 kg) of hazardous waste or 2.2 lbs (1 kg) of acutely hazardous waste in any calendar month, you will need to obtain an EPA identification

number. Also, if you accumulate more than 2,200 lbs (1,000 kg) of hazardous waste at any one time, you will need an EPA identification number. Some states also require generators of less than 220 pounds of hazardous waste to have identification numbers. Information for hazardous waste generators and a link for obtaining an EPA hazardous waste generator identification number can be found at <http://www.epa.gov/osw/hazard/generation/index.htm>.

### Offering Hazardous Waste for Transportation

Transporters of certain quantities and types of hazardous materials, including hazardous wastes, are required to file an annual registration statement with the U.S. Department of Transportation (DOT) and to pay a fee (see *Title 49 CFR Part 107, Subpart G* (107.601 - 107.620). See <http://phmsa.dot.gov/hazmat/registration> for details.

### Uniform Hazardous Waste Manifest

A Uniform Hazardous Waste Manifest form must be prepared by all generators who transport or offer for transport, hazardous waste for off-site treatment, recycling, storage or disposal. It contains information on the type and quantity of the waste being transported, instructions for handling the waste and signature lines for all parties involved in the disposal process. The manifest is required by both Department of Transportation and EPA <http://www.epa.gov/osw/hazard/transportation/manifest/index.htm>.

### State Waste Regulations

In addition to required compliance with federal EPA and U.S. DOT regulations, it is important to assure compliance with state and local regulations that apply to hazardous and universal wastes. Some states may have permit and disposal requirements for significant quantities of industrial (special) waste streams. Links to your local state regulations can be found at:

- Hazardous Wastes <http://www.epa.gov/osw/wyl/stateprograms.htm>
- Universal wastes <http://www.epa.gov/epawaste/hazard/wastetypes/universal/statespf.htm>



Additional state-by-state guidance concerning hazardous waste can be found at the Environmental Compliance Assistance Platform (EnvCAP) Hazardous Waste Resource Locator.

## Recordkeeping and Reporting

Generators are required to keep records of hazardous waste shipments, any test results, waste analyses etc. for specified periods of time. Certain generators must submit reports to the EPA. See 40 CFR 262 Subpart D Recordkeeping and Reporting for details. This type of recordkeeping is necessary, even when the UV/EB processing wastes are not classified as hazardous.

## Training

The hazardous waste generator must ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures relevant to their responsibilities during

normal facility operations and emergencies. Characterization and disposal of hazardous wastes always should be performed under the direction of a "trained professional." A trained professional means a person who has completed the applicable RCRA training requirements of §265.16 for large quantity generators, or is knowledgeable about normal operations and emergencies in accordance with §262.34 (d)(5)(iii) for small quantity generators and conditionally exempt small quantity generators. A trained professional may be an employee, contractor or vendor who meets the requisite training requirements. This type of training is good practice, even when the UV/EB processing wastes are not classified as hazardous.

## Typical Industrial Waste Management Practices

Waste and wastewater profiles always should be provided to your licensed waste disposal contractor and local POTW to ensure safe disposal in full compliance with all applicable regulations. These profiles should be reviewed regularly to assure that they remain current.

Companies that meet any of the Hazardous Waste Generator definitions or that require a National Pollutant Discharge Elimination System (NPDES) permit must establish programs and organizational systems to assure compliance with all applicable regulatory requirements.

UV/EB-curing materials that demonstrate a potential for strong exothermic reaction or that contain solvents or toxic components may meet the criteria for classification as hazardous waste and must be disposed of properly, in full compliance with all applicable EPA and local regulations. There are strict limits on the quantities of hazardous wastes that can be accumulated and limits on storage times (see Table 2 for details).

If the wastes are not listed as hazardous wastes or do not meet any of the hazardous waste characteristics, they may be disposed of as nonhazardous wastes in full compliance with all state and local regulations that apply to similar paints and coatings materials. This may require solidification or other treatment before disposal in a municipal landfill. However, even though UV/EB chemical

wastes may not be classified as hazardous, these materials frequently are disposed of by incineration or in a hazardous landfill to avoid inadvertent contractor or public contact with potentially irritating substances.

UV converting operations generate used electronic equipment and spent UV lamps that typically are not recycled, and all industrial operations generate "universal" and electronic wastes that must be disposed of in compliance with applicable regulations.

Quantities of wastewater and site storm water runoff discharged and expected contaminants should be reviewed with the local POTW to establish a site wastewater profile, and to determine the scope of any required permits.



**Table 2. EPA Waste Generator Summary Chart** (<http://www.epa.gov/osw/hazard/generation/summary.htm>)

	CESQGs	SQGs	LQGs
Quantity Limits	≤100 kg/mo ≤1 kg/mo:acute hazardous waste >100 kg/mo:acute spill residue/soil §§261.5(a) and (e)	Between 100 to 1,000 kg/mo §262.34(d)	≥1,000 kg/mo >1 kg/mo of acute hazardous waste >100 kg/mo:acute spill residue/soil Part 262 and §261.5(e)
EPA ID Number	Not required §261.5	Required §262.12	Required §262.12
On-Site Accumulation Quantity	≤1,000 kg ≤1 kg acute ≤100 kg of acute spill residue or soil §§261.5(f)(2) and (g)(2)	≤6,000 kg §262.34(d)(1)	No limit
Accumulation Time Limits	None §261.5	≤180 days or ≤270 days (if greater than 200 miles) §§262.34(d)(2) and (3)	≤90 days §262.34(a)
Storage Requirements	None §261.5	Basic requirements with technical standards for tanks or containers §§262.34(d)(2) and (3)	Full compliance for tanks, containers, drip pads or containment buildings §262.34(a)
Sent To	State approved or RCRA permitted/interim status facility §§261.5(f)(3) and (g)(3)	RCRA permitted/interim status facility §262.20(b)	RCRA permitted/interim status facility §262.20(b)
Manifest	Not required §261.5	Required §262.20	Required §262.20
Biennial Report	Not required §261.5	Not required §262.44	Required §262.41
Personnel Training	Not required §261.5	Basic training required §262.34(d)(5)(iii)	Required §262.34(a)(4)
Contingency Plan	Not required §261.5	Basic plan §262.34(d)(5)(i)	Full plan required §262.34(a)(4)
Emergency Procedures	Not required §261.5	Required §262.34(d)(5)(iv)	Full plan required §262.34(a)(4)
DOT Transport Requirements	Yes (if required by DOT)	Yes §§262.30-262.33	Yes §§262.30-262.33

## References

1. This document contains direct excerpts from a number of government and agency Web sites highlighted as Internet links. Click on the associated links to access the complete text from these referenced sources.
2. OECD Environment, Health and Safety Publications Series on Emission Scenario Documents No. 21 EMISSION SCENARIO DOCUMENT ON THE FORMULATION OF RADIATION CURABLE COATINGS, INKS AND ADHESIVES, 27-Jan-2010, Table B-5, page 145.
3. See EPA Definitions Of Hazardous Wastes on the following page.
4. EPA defines solid waste as garbage, refuse, sludge or other discarded material (*including solids, semisolids, liquids and contained gaseous materials*).
5. The EPA has proposed to conditionally exclude from the definition of hazardous waste disposable industrial wipes that are contaminated with hazardous solvents and are going to disposal and conditionally exclude from the definition of solid waste reusable industrial shop towels and rags that are contaminated with hazardous solvents and are sent for laundering or dry cleaning, but publication of a final rule is still pending.
6. OECD Environment, Health and Safety Publications Series on Emission Scenario Documents No. 21 EMISSION SCENARIO DOCUMENT ON THE FORMULATION OF RADIATION CURABLE COATINGS, INKS AND ADHESIVES, 27-Jan-2010, page 61.
7. OECD Environment, Health and Safety Publications Series on Emission Scenario Documents No. 21 EMISSION SCENARIO DOCUMENT ON THE FORMULATION OF RADIATION CURABLE COATINGS, INKS AND ADHESIVES, 27-Jan-2010, Table B3, page 142.
8. See Table 2 for more details on Waste Generator classifications and responsibilities.