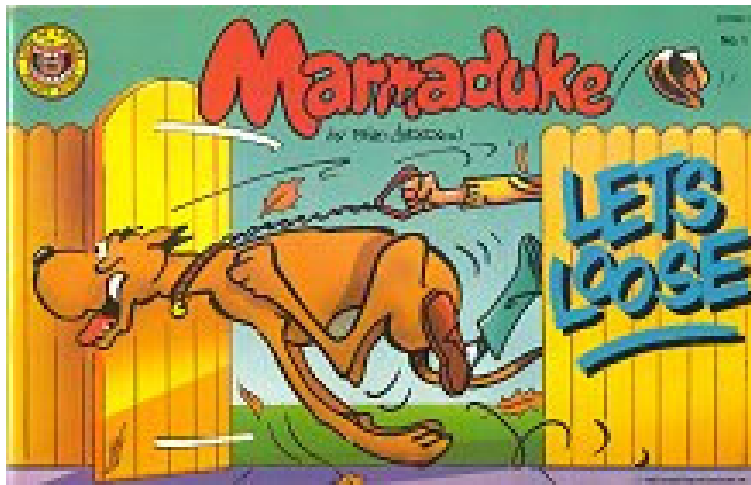


Hazardous Waste Disposal Issues for IT

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Kicking and Screaming...

The classic Marmaduke comic strip provides an apt metaphor of the entry of the Berea College Information Systems & Services (IS&S) department into the world of hazardous waste disposal issues and regulations. We are Phil Winslow dragged along on a “walk” by Marmaduke, an enthusiastic juggernaut who can barely be steered and can certainly not be stopped. Berea College, like many other institutions, has seen explosive growth over the last decade in the amount of information technology equipment that must be managed to provide adequate access to software capabilities, electronic communication and Internet based resources for our students and faculty. As all this equipment has aged and begins to require replacement, and particularly as laptop computers have generated a flow of spent batteries, we have had to learn about proper disposal practices and set up processes to handle equipment and batteries coming out of service.



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In 1997, Berea College published a Campus Information Resource Plan which called for dramatic increases in access to computers and network connectivity for our students. This plan led to the development of our EDGE (Empowering a Dynamic Generation in Education) program, launched in the fall of 2002, which provides a laptop computer to every student. In 1997, old computers were sold at the annual surplus property auction and hazardous waste was an issue for the Chemistry department, not IS&S. By 2003, IS&S had a storage room full of obsolete and non-functional computer equipment that we did not want to inflict on other institutions or the local population. The summer of 2004 saw our first wave of laptop computer battery replacements, generating a pool of 800 spent lithium ion batteries we didn't know how to dispose of. And this year we are seeing the first mass replacement of student laptop computers. At the same time, the expanding adoption of laptop computers and LCD monitors has created a high rate of retirement of older CRT monitors. CRT monitors are made of leaded glass. Batteries are full of chemicals. Switches contain mercury. Circuit boards are made with leaded solder. California has declared LCD monitors and laptop computers to be hazardous waste¹. Berea College IS&S is in the hazardous waste business.

Everyone's Problem...

Lots of other IT folks are in the business along with us. Statistics are often quoted implying that millions of obsolete computers are piling up and that a large backlog of disposal issues exists. According to a recent presentation by an EPA representative, 50 million computers are becoming obsolete each year and 2 million tons of electronic equipment are being discarded annually². Representatives of a waste handling company have indicated that by 2007, over 500 million PC's will have become obsolete and require disposal³. These statistics may be based on a 1999 study published by the National Safety Council⁴ and a 2003 study published by the International Association of Electronics Recyclers (IAER)⁵. A summary of selected information from the IAER study can be found in Compumentor's fall 2004 research report⁶.

So what's a higher education IT professional to do? First, let's get familiar with some terms.

Defining Some Terms...

Waste Stream: The definition below comes from the U.S. Environmental Protection Agency (EPA) web site, a good source for information about terms, acronyms, regulations, etc. Electronic equipment and used batteries are sometimes referred to as specific waste streams.

“The total flow of solid waste from homes, businesses, institutions, and manufacturing plants that is recycled, burned, or disposed of in landfills, or segments thereof such as the ‘residential waste stream’ or the ‘recyclable waste stream.’”⁷

Generator: In the context of hazardous waste disposal, that means you and me and our employers, as opposed to a component for an old automobile or hydroelectric plant. The definition excerpt below from the EPA web site points out that one is a generator if one's action causes hazardous material to move from being in use or in storage to being slated for disposal.

“**Generator:** ... 2. Any person, by site, whose act or process produces regulated ... waste or whose act first causes such waste to become subject to regulation...”⁸

TCLP: Pronounced “tee clip”. I couldn't find a good definition from the EPA, so I offer this one from Aerotech Laboratories, Inc.

“Toxic Characteristic Leaching Procedure (TCLP) is an EPA SW-846 analytical method (Method 1311) that simulates sanitary landfill contaminant leaching in waste samples. Based upon concentrations of the TCLP constituents and guidelines set forth in 40 CFR 261.4, the solid waste samples can be deemed hazardous or non-hazardous.”⁹

TCLP is the accepted procedure for determining whether waste material is deemed hazardous. According to a recent e-scrap seminar put on by the Kentucky Department for Environmental Protection Division of Waste Management that about 70% of CRT monitors when crushed and submitted to a TCLP evaluation¹⁰, will be deemed hazardous waste. A 1999 University of Florida study found that 21 of 36 monitors tested (58%) were deemed hazardous by TCLP.¹¹

Universal Waste: The EPA defines certain hazardous waste in this category because of its high volume and large number of generators in order to make the disposal process more economically feasible. Their web site states:

“The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (e.g., thermostats) and lamps (e.g., fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal.”¹²

Due diligence: Refers to the exercise of an acceptable level of care to assure that our handling of hazardous waste materials and the actions of our business partners are not in violation of law or damaging to the environment. A general definition from Wikipedia reads:

“**Due diligence** (also known as *due care*) is the effort made by an ordinarily prudent or reasonable party to avoid harm to another party.”¹³

Cradle to grave responsibility: Everyone who handles a given unit of hazardous waste shares in the responsibility for any negative environmental impact caused by that waste, no matter whose mismanagement, error or misjudgment caused the problem. The EPA web site explains in more detail:

“Under the full Subtitle C program (hazardous waste program), only the waste handler that violates a hazardous waste regulation is “liable” (i.e., subject to enforcement) for that violation. Generators of hazardous waste are not responsible for mismanagement by subsequent waste handlers. The universal waste rule does not change this allocation of responsibility. Generators **are** responsible for subsequent mismanagement under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA or Superfund), however. The universal waste rule does not change CERCLA liability. Since universal waste are still hazardous wastes, entities that generate universal waste remain liable under CERCLA for remediation of any releases of universal waste.”¹⁴

Hazardous waste regulatory requirements vary depending on the rate of material entering the waste stream from a generator.

“**Conditionally Exempt Generators (CE):** Persons or enterprises which produce less than 220 pounds of hazardous waste per month. Exempt from most regulation, they are required merely to determine whether their waste is hazardous, notify appropriate state or local agencies, and ship it by an authorized transporter to a permitted facility for proper disposal.”¹⁵

“**Small Quantity Generator (SQG-sometimes referred to as "Squeegee"):** Persons or enterprises that produce 220-2200 pounds per month of hazardous waste; they are required to keep more records than conditionally exempt generators. The largest category of hazardous waste generators, SQGs, include automotive shops, dry cleaners, photographic developers, and many other small businesses.”¹⁶

“Large Quantity Generator: Person or facility generating more than 2200 pounds of hazardous waste per month. Such generators produce about 90 percent of the nation's hazardous waste, and are subject to all RCRA requirements.”¹⁷

Legal Regulations...

Second, let's get to know some of the legal regulations that guide us in properly managing waste materials. RCRA, the Resource Conservation and Recovery Act (often pronounced “rickruh”) is the law enacted in 1976 that defines hazardous waste handling, reporting and disposal requirements.¹⁸ CERCLA, the Comprehensive Environmental Response Compensation and Liability Act, enacted in 1980, defines liability for the costs of response to environmental damage due to hazardous waste and establishes the “superfund” for addressing the cost of response where no liable parties can be found.¹⁹ Each state will also have regulations that may be more stringent than the federal laws require. Universal Waste regulations provide for exemptions from some of the requirements of RCRA for certain high volume item. Batteries are in this category and CRT monitors and other electronic equipment are under consideration for inclusion. As long as one follows the guidelines for managing eligible material as Universal Waste, the exemptions apply. However, if those materials are improperly handled, all the requirements and potential penalties of RCRA apply. Regulations for Universal Waste vary according to the volume of waste accumulation. Most colleges will fall into the Small Quantity Generator category, accumulating less than 11,000 pounds of waste at any given time²⁰.

Electronic Equipment...

Now we can talk about our inventory of out of service equipment. At Berea College, we started by looking for a partner to help us properly dispose of or recycle our growing stockpile of computer equipment we could no longer use. At first it was free, or perhaps they would even buy us a round of pizza. More recently, as the disposal of CRT monitors became more expensive, and resale of old computers became less profitable, there has been a charge per unit. We are fortunate that a local computer and parts resale company has now become a full service e-scrap recycler. The goal is to turn equipment over to them before it becomes waste. We are able to turn equipment over to them and receive documentation by serial number where applicable that they have received the equipment as usable or potentially repairable. They then apply their own procedures to determine whether the equipment will be refurbished and reused, processed for recycling, or processed for disposal. If at that point the equipment becomes hazardous waste, they are the generator. This method may not be valid in all states. In a recent seminar with Kentucky Department of Environmental Protection staff, there were differences of opinion regarding the implications of state regulations, but we believe ourselves to be in compliance.

It is possible that electronic equipment will soon be defined as a Universal Waste. According to a document published by the EPA in June 2002, CRT monitors are under consideration for inclusion in the Universal Waste category.²¹ There are those who oppose the idea²², and no decision seems to have been made. I have been told but have not been able to verify that a decision was originally expected by October, 2005 and that other electronic equipment was being considered along with CRT monitors. If a commodity is defined as a Universal Waste, it can be turned over to a licensed Universal Waste handler without detailed documentation, can be stored on your site for up to one year, and does not contribute to your hazardous waste generation rate for purposes of regulatory classification as a conditionally exempt, small quantity or large quantity generator.

If, on the other hand, the trend for electronic equipment moves toward greater regulation, we could end up with reporting, storage, and transportation requirements for some items similar to those currently in force for hazardous chemical wastes.

Selecting a Recycling Partner...

When selecting a service partner, one needs to consider capacity, service, price, and values. The provider must be able to handle the volume of equipment being transferred. UNICOR presents capacity as an important consideration in the Veterans Administration decision to use their services.²⁴ Most small colleges do not have such large volume, so other factors will likely be more important. At Berea College, we see the quick service and low transportation costs available from local service provider Kentucky Recycling as an important factor. We also place a high value on recycling and processing controls, one of the factors that led us to use Big Green Box for battery recycling. A recent front page article in the Lexington Herald-Leader decried the “primitive” processes used by e-waste processing facilities in China²³. Those concerned about overseas waste disposal problems may want to choose a partner that is careful about downstream processes and assures that they will be up to an agreed-upon standard beyond that legally required by the locale. Of course, if the downstream processing is in the USA, the cradle to grave responsibility concept makes it important to verify that good controls are in place. UNICOR, a part of the Federal Prison Industries, touts their high worker safety standards.²⁵ Worker safety may be an important consideration, and the use of prison labor is seen by some as a positive factor and by others as a bad idea. Each organization will want to evaluate options in the light of all these considerations and their own values and needs.

Prevention and Purchasing...

Prevention can also be an important part of your electronic waste strategy. Keeping equipment in good repair and using eBay or other methods to sell or donate it to another person or organization as soon as it is no longer needed will prevent the accumulation of equipment for disposal. The EPA’s electronics recycling web site contains information about equipment donation and an overview of equipment purchasing environmental considerations.²⁶ When purchasing new equipment, one needs to consider the entire life cycle. Leasing may be a good option, providing a standard level of equipment currency and a program for moving the equipment on to another use or disposal at the end of the term. Some manufacturers offer end of life equipment disposal service as part of the equipment purchase. Other considerations include ease of disassembly and component chemistry options. Equipment that is glued inside a plastic case is more expensive to break down for recycling at end of life than equipment for which the case opens easily. One might choose a manufacturer who uses more biodegradable materials or fewer hazardous materials. The City of Portland, Oregon has included many of these factors in their procedure for procurement of electronic equipment.²⁷ Taking disposal issues into account when purchasing equipment can reduce later concerns with cost and regulatory issues associated with hazardous waste.

Toner and Ink Cartridges...

Recycling of copier and printer toner and ink cartridges has been around for quite a while. Depending on the formulation, waste toner may be designated as hazardous, but as long as the cartridges are used up and sent for recycling, they will not be classified as regulated waste.²⁸ Lex-

mark, HP and others typically provide return-for-recycling packaging with toner cartridges. CORE Recycling Concepts and other vendors will purchase properly packaged spent toner and ink cartridges. CORE points out that it is important to keep inkjet cartridges separate because toner powder will clog the jets and render them unusable.²⁹

Batteries...

At last we arrive at the subject that started the hazardous waste discussion at Berea College IS&S – laptop batteries. In the spring of 2004, as we looked ahead at the impending replacement of over 800 batteries used in the laptop computers issued to our first and second year students, we were presented with a welcome opportunity. One of our student administrative assistants needed a project for her senior seminar in Environmental Studies. We suggested the battery disposal challenge and soon had a student-faculty-staff partnership going. Her research surfaced two viable options, RBRC and Big Green Box. We later found that a third option existed in the company that handles our other universal wastes such as lead/acid batteries and fluorescent light bulbs and ballasts. RBRC, the Rechargeable Battery Recycling Corporation, handles all types of rechargeable batteries at no charge to generators. The only cost would be shipping. Since batteries are considered Universal Waste, the shipping must be in a container approved by the U.S. Department of Transportation (DOT) for the purpose. While our original study identified RBRC as the lowest cost option, when we later evaluated more carefully the cost of proper shipping containers and shipping costs, the difference was minimal. Big Green Box, the service recommended by our study and subsequently deployed, provides a standard DOT approved container for collecting and shipping batteries. Shipping and processing costs are prepaid at the time the boxes are purchased. Another factor that attracted us to Big Green Box was that their process results in recycling all components of the battery including plastic and chemicals. RBRC's process disposes of lithium, plastics and some other components by incineration. As a Universal Waste, batteries are allowed to be stored at the generator's site for no more than one year. A system must be in place that will demonstrate the maximum length of time each waste battery is stored. To address that issue, we simply write the date on the box when the first battery is placed into it. We also report each box to our Environmental Health and Safety office so required records can be kept and reporting done regarding the college's volume of waste accumulation.

Berea College has been pleased with the Big Green Box battery recycling program. Since beginning our process, we have sent out 24 boxes each containing about 40 batteries. We have verified that Big Green Box is a certified Universal Waste handler and that their containers are DOT approved for shipping batteries. Our recycling office is working on programs to collect various types of batteries from students and staff, and they are also considering use of the Big Green Box product.

Review and Conclusions...

As IT departments must deal with more and more equipment coming out of service, management processes must address hazardous waste issues. Strategies for prevention and proper disposal are available to minimize the cost and headaches. By selling operational used equipment and by connecting with reliable equipment recycling partners, organizations and individuals can avoid declaring electronic equipment as waste and will not need to determine if it is deemed hazardous. Using up toner and selling or returning spent toner cartridges for recycling avoids the need to handle toner as potentially hazardous waste. Disposing of batteries according to Universal

Waste regulations can result in a workable and affordable process. Exercising due diligence to verify that one's own processes and those used by recycling and disposal partners are sound and compliant with regulations can minimize risk of future liabilities. By keeping informed about regulations, risks and options, IT professionals can maintain a total management program that helps protect their organizations from the hazards of waste disposal.

Internet resources that may be of interest...

General information site for electronics recycling and disposal:

<http://www.waste.ky.gov/programs/rcla/Electronics+Recycling.htm>

A concise review of hazardous waste disposal basics:

http://www.osh.net/articles/archive/osh_basics_2002_aug28.htm &
http://www.osh.net/articles/archive/osh_basics_2002_sept30.htm

Presentation on electronic equipment hazardous waste considerations:

<http://www.federalelectronicchallenge.net/resources/docs/tonetti.pdf>

A review of electronic equipment disposal due diligence concepts:

<http://www.ciwmb.ca.gov/HHW/Events/AnnualConf/2005/April28/Session1/E-WastePgmMgmt/E-wasteDD.pdf>

National Recycling Coalition – a source of information about all recycling:

<http://www.nrc-recycle.org/default.htm>

International Association of Electronics Recyclers:

<http://www.iaer.org/>

Institute of Scrap Recycling Industries:

<http://www.isri.org/>

National Center for Electronics Recycling:

<http://www.electronicrecycling.org/NCER/>

Big Green Box:

<http://www.biggreenbox.com/StoreFront.bok>

Rechargeable Battery Recycling Corporation:

<http://www.rbrc.org/call2recycle/>

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