

STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



August 15, 2002

Mr. Steven P. Kaiser, Esq.  
39 S. LaSalle Street, Suite 404  
Chicago, IL 60604

Re: Regulations Governing the Crushing of Fluorescent Lamps

Dear Attorney Kaiser:

This is in response to your letter dated April 16, 2002 (see Attachment 4) concerning the regulations governing the crushing of fluorescent lamps, and specifically the fluorescent lamp crushing devices manufactured by your client, Air Cycle Corporation (hereinafter "Air Cycle"). In your April 16 letter, you make reference and respond to an undated letter (circa December, 1999) from Robert Isner of this Bureau (see Attachment 5), and set forth several arguments as to why Air Cycle's lamp crushers meet the five criteria listed in the 1991 DEP policy for small and large quantity generators' treatment in accumulation tanks and containers (hereinafter "the 1991 policy").

We have reviewed your letter and the arguments you presented in favor of Air Cycle's lamp crushers meeting the five criteria of the 1991 policy. However, after carefully considering these arguments, we have concluded that lamp crushers fail to meet three of these five criteria, for reasons described in detail in Attachment 1. As a result, generators of lamps in Connecticut may not avail themselves of the 1991 policy with respect to the use of lamp crushers, and these devices may not be used by hazardous waste generators in Connecticut unless such generators have obtained a hazardous waste treatment permit.

In addition, please be advised that we recently modified our state hazardous waste regulations in Connecticut to adopt the federal Universal Waste Rule with respect to fluorescent lamps.<sup>1</sup>

<sup>1</sup> Connecticut's universal waste requirements are found in Section 22a-449(c)-113 of the state hazardous waste regulations. This section incorporates the federal universal waste requirements at 40 CFR 273, with certain additions and modifications. This section was first adopted on October 31, 2001, and was modified on June 27, 2002. At the time that the Universal Waste Rule was adopted, we also changed our state solid waste regulations to add a new section (i.e., Section 22a-209-17) that imposes universal waste requirements on non-hazardous lamps in Connecticut. A complete copy of the current hazardous waste regulations (which includes both of the sections referenced above) is provided as Attachment 6. For the sake of simplicity, references in this letter to Universal Waste requirements shall utilize the federal citation/numbering system; however, as noted above, the state regulations may specify certain additions or modifications to these federal provisions.

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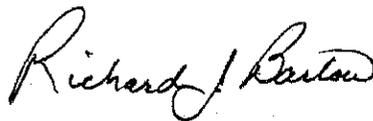
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As a result, generators of fluorescent lamps are no longer required to manage such lamps in accordance with the hazardous waste generator requirements (or the 1991 policy), but may instead manage them in accordance with the Universal Waste Rule. Since our adoption of the Universal Waste Rule constitutes a major change to the regulatory requirements for fluorescent lamps in Connecticut, and since most generators of fluorescent lamps prefer to manage them as universal wastes, it would appear appropriate to address the regulatory status of fluorescent lamp crushers under this rule, so as to provide you with a complete picture of the regulatory landscape with respect to these devices in this state. A detailed discussion of this topic is provided in Attachment 2 of this letter. However, to summarize, the use of lamp crushers by small and large quantity handlers of universal waste is not allowed under the Universal Waste Rule.

And lastly, I understand that in speaking with Ross Bunnell of my staff, you indicated that you would appreciate updated answers to the several questions that were responded to in the 1999 Isner letter, in light of Connecticut's adoption of the Universal Waste Rule. The updated responses to these questions are provided in Attachment 3 of this letter.

If you have any further questions on this matter, please contact Ross Bunnell of my staff at (860) 424-3274, or by email at [ross.bunnell@po.state.ct.us](mailto:ross.bunnell@po.state.ct.us).

Sincerely,



Richard J. Barlow, Chief  
Bureau of Waste Management

RJB:RQB

Cc: Scott Beierwaltes  
Air Cycle Corporation  
2000 South 25<sup>th</sup> Avenue, Suite C  
Broadview, IL 60155

Attachment 1: Regulatory Status of Fluorescent Lamp Crushers under Hazardous Waste Generator Requirements and the 1991 Policy  
Attachment 2: Regulatory Status of Fluorescent Lamp Crushers under the Universal Waste Rule  
Attachment 3: Updated Responses to Questions in 1999 Isner Letter  
Attachment 4: April 16, 2002 Atty. Kaiser Letter  
Attachment 5: Undated Letter from Robert Isner (circa December 1999)  
Attachment 6: June 27, 2002 Hazardous Waste Management Regulations

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## ATTACHMENT 1

### Regulatory Status of Fluorescent Lamp Crushers under Hazardous Waste Generator Requirements and the 1991 Policy

As noted in Attachment 2 of this letter, universal waste handlers may not engage in the treatment of universal waste, and the crushing of lamps is considered a form of treatment under the Universal Waste Rule. The discussion in this attachment is therefore predicated on the idea that a generator could opt out of the Universal Waste Rule, and voluntarily comply with full RCRA Subtitle C hazardous waste requirements with respect to the management of its lamps. Such a generator would be able to engage in treatment (i.e., crushing) without a RCRA treatment permit, if the treatment process met the five criteria outlined in the 1991 policy.

Provided below are detailed evaluations of Air Cycle's lamp crushers under each of the five criteria of the 1991 policy. As noted below, the lamp crushers fail to meet three of these five criteria, and thus can not be managed under the 1991 policy.

#### Criterion #1: No releases of hazardous constituents to air, water, or soil.

For a number of reasons, it does not appear that the Air Cycle lamp crusher meets this standard.

First, according to Air Cycle's own claims, their lamp crushers capture only 99.98 percent of the mercury vapor released during crushing. This means that 0.02 percent of the mercury vapor is released to the air. Therefore, however small, the use of these crushers does involve a release to the environment.

Moreover, other information available to DEP indicates that real-world capture rates for lamp crushers such as Air Cycle's would be significantly less than the 99.98 percent figure referenced above. For example, as noted in the preamble for the July 6, 1999 federal rule that added lamps to the Universal Waste Rule, EPA noted that "[a]vailable studies show that emission percentages from drum top crushing range from 10 to 100 percent of the total elemental mercury in the lamps, depending on the operating conditions and supplemental controls used" (emphasis added). 66 FR 36471, column 1. Note that even the lower end of this range - ten percent - is much higher than 0.02 percent, and would surely constitute a significant source of air emissions.

In addition to EPA's published accounts of mercury emissions from lamp crushers, our inspectors who have seen lamp crushers in use in the field have reported that they are often poorly maintained, misused, damaged, or otherwise incapable of preventing emissions of mercury to the air. These observations only further support our conclusion that capture rates will be significantly less than 99.98 percent in real-world applications.

It should also be noted that when lamps are crushed (as opposed to shipped off-site intact), mercury emissions may occur during storage after crushing. Crushed lamps would presumably

be stored in ring-top drums or similar containers, which are typically not capable of containing mercury vapors that may be generated during storage (e.g., from cyclic heating as a result of being exposed to sunlight).

There were two additional arguments raised in the April 16, 2002 letter concerning the issue of emissions, namely: (1) that crushing produces less emissions than is produced by accidental breakage during the transportation of intact lamps; and, (2) that crushing diverts lamps from landfills to permitted recycling facilities. With respect to the first point, in our experience lamps do not "frequently" break in transit; rather, the recycling facilities utilized in Connecticut report a breakage rate of one percent or less. With respect to the second point, the regulations in Connecticut are such that disposal in a landfill is not a legal option in this state. And, since Connecticut is currently serviced by several firms that accept intact lamps for recycling, plenty of appropriate recycling options are available in this state.

Criterion #2: No significant likelihood that treatment will result in an explosion, fire, or generation of toxic mists, fumes, dusts, or gases.

See the response for criterion #1 above. Based on EPA data and DEP field observations, there is a significant likelihood that the use of lamp crushers will result in the generation and emission of toxic fumes (i.e., mercury vapor). Therefore, it does not appear that the Air Cycle lamp crusher satisfies this criterion.

Criterion #3: Treatment should occur when wastes are first placed in the accumulation container.

As indicated in the April 16, 2002 letter, lamps are placed in the accumulation drum as they are crushed. This criterion would therefore appear to be satisfied.

Criterion #4: Treatment should only occur when there is an environmental benefit.

There does not appear to be any significant environmental benefit to using drum top crushers. Rather, it appears that the primary purpose of the units is simply to achieve volume reduction and save on transportation costs. With respect to the argument in the April 16, 2002 letter that there is an environmental benefit in the form of reduced mercury emissions when drum-top crushers are used, the discussion under criterion #1 above refutes this conclusion. Under real-world scenarios, it appears that emissions from drum-top crushers would be comparable to (or greater than) those produced when lamps are shipped intact. We also cannot agree with the argument that allowing crushing will increase recycling and reduce landfill disposal, since landfill disposal is not currently a legal option in Connecticut (for both hazardous and non-hazardous lamps). Based on the above, therefore, we do not believe that this criterion is satisfied.

Criterion #5: Ensuring that employees are familiar with proper waste handling and emergency procedures.

In reviewing your response on this issue, it is evident that individual generators should be able to provide the proper level of training for employees operating these units. It therefore appears that individual generators would be capable of satisfying this criterion.

## ATTACHMENT 2

### Regulatory Status of Fluorescent Lamp Crushers under the Universal Waste Rule

DEP issued regulations adopting the federal Universal Waste Rule provisions for fluorescent lamps effective October 31, 2001, and amended these regulations on June 27, 2002. The Universal Waste Rule specifically prohibits treatment by small and large quantity handlers of universal waste (including fluorescent lamps). In particular, 40 CFR 273.11 indicates that small quantity universal waste handlers are “[p]rohibited from diluting or treating universal waste, except by responding to releases as provided in 40 CFR 273.17; or by managing specific wastes as provided in 40 CFR 273.13.” 40 CFR 273.31 includes an identical provision for large quantity handlers of universal waste. The crushing of fluorescent lamps in a lamp crusher would not constitute “responding to a release” as described above, and the “specific wastes” for which certain kinds of treatment are allowed are limited only to universal waste batteries (as provided in 40 CFR 273.13(a) and 273.33(a)) and thermostats (as provided in 40 CFR 273.13(c) and 273.33(c)). As a result, neither of these exceptions to the prohibition on treatment would apply to the use fluorescent lamp crushers. Therefore, assuming that lamp crushing qualifies as “treatment,” it is prohibited for small and large quantity handlers of universal waste.

While there is no definition of “treatment” in the Universal Waste Rule, there is such a definition in 40 CFR 260.10 (which, as noted at the beginning of this section, applies to Part 273):

“Treatment means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store or dispose of; or amenable for recovery, amenable for storage, or reduced in volume.”

Lamp crushing clearly falls within this definition in several respects, most notably in that it changes the physical character of a hazardous waste so as to recover material resources, renders it amenable for recovery, and/or reduces its volume.

In addition to being supported by a plain reading of the regulations, there is additional support for this conclusion in the preamble to the federal rule modifying the Universal Waste Rule to add fluorescent lamps (i.e., 64 FR 36465-36490, July 6, 1999). In pages 36477-36478 of this preamble, EPA recites the above definition of “treatment” and states that “[t]he crushing of spent mercury-containing lamps clearly falls within this definition.” EPA goes on to state that:

“the Agency does not believe that universal waste handlers, who are not required to comply with the full Subtitle C management standards, should treat universal wastes. Therefore, under today’s rule, both small and large quantity handlers of universal waste lamps are prohibited from diluting or treating

universal waste lamps... The prohibition against treatment includes a prohibition of crushing of lamps. EPA is particularly concerned that uncontrolled crushing of universal waste lamps in containers meeting only the general performance standards of the Universal Waste Rule would not sufficiently protect human health and the environment.”

The foregoing summarizes the Universal Waste Rule requirements as they relate to the crushing of lamps by generators. With respect to crushing which occurs at off-site recycling facilities, such facilities would be subject to the destination facility requirements in 40 CFR 273 Subpart E, including the requirement to obtain a RCRA permit as set forth in 40 CFR 273.60(a) for facilities that store lamps prior to recycling them. In addition, such facilities would be subject to the permitting requirements of Connecticut General Statutes Sections 22a-208a, 22a-209e, and/or 22a-454, as applicable.

## ATTACHMENT 3

### Updated Responses to Questions in 1999 Isner Letter

Provided below are updated responses to the fourteen questions posed in the October 20, 1999 Air Cycle letter, which were originally answered in undated DEP letter (circa December, 1999), regarding fluorescent lamp regulations in Connecticut (copy included as Attachment 5).

**1) Is "controlled" or "closed cycle" crushing of fluorescent lamps, to reduce volume and handling, acceptable to your state's Hazardous Waste Division?**

The answer to this question differs slightly, depending on whether fluorescent lamps are managed as fully-regulated hazardous wastes, or as universal waste. Both answers are provided below.

If lamps are managed as fully-regulated hazardous waste. As noted in Attachment 1 of this letter, crushing of fluorescent lamps is not consistent with the 1991 policy in that it does not satisfy three of the five listed criteria. As a result, generators of hazardous waste lamps may not process them in lamp crushers without a RCRA treatment permit.

If lamps are managed as universal waste. As noted Attachment 2, treatment of universal waste by small and large quantity universal waste handlers is prohibited, and the crushing of universal waste lamps may only be performed by recycling facilities operating under the terms of a RCRA permit and/or a state permit.<sup>2</sup>

**2) What is the crushed fluorescent lamp by-product considered in your state? Hazardous, universal, or special Waste?**

First, please note that DEP considers crushed and uncrushed fluorescent lamps to be spent materials, not by-products.<sup>3</sup> This having been said, if crushed lamps exhibit a characteristic of hazardous waste (e.g., fail TCLP for mercury), they would be classified as a hazardous waste. Such crushed lamps would not be classified as a universal waste or special waste.

**3) Can the drums be sent to a municipal landfill? Under any conditions?**

Connecticut's solid and hazardous waste regulations do not allow the disposal of hazardous waste in municipal landfills in this state. This specifically includes hazardous waste generated by Conditionally Exempt Small Quantity Generators ("CESQGs"). As a result, any quantity of crushed lamps that exhibits a characteristic of hazardous waste (e.g., fails TCLP for

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<sup>2</sup> If storage occurs prior to recycling, a RCRA storage facility permit would be required. In addition, facilities that are engaged in the business of recycling fluorescent lamps would have to have a permit under CGS Section 22a-454 or 22a-208a, regardless of whether or not any storage occurs.

<sup>3</sup> See the July 6, 1999 EPA final rule preamble, 64 FR 36467, column 1: "[s]pent hazardous waste lamps sent for reclamation are considered spent materials (rather than sludges or by-products) and are therefore solid wastes."

mercury) would be prohibited from disposal in a municipal landfill in Connecticut. However, CESQGs located in Connecticut may dispose of their hazardous crushed lamps at an out-of-state municipal landfill, provided that such disposal is consistent with any state and/or local requirements that apply to that landfill.

**4) Can they be sent to a hazardous waste landfill?**

Yes. However, please note that no such landfills are currently operating in Connecticut.

**5) How should the generator label the drums before they are sent to a hazardous waste landfill?**

Under Connecticut's hazardous waste regulations, Small Quantity Generators ("SQGs") and Large Quantity Generators ("LQGs") would be required to mark drums of hazardous crushed lamps with the words "Hazardous Waste" and a description of the contents (e.g., "crushed mercury containing lamps"). In addition, the standard yellow and red hazardous waste label would have to be properly filled out and applied to the drum.

CESQGs in Connecticut are not subject to any particular labeling requirements with respect to their hazardous crushed lamps. However, CESQGs are recommended to employ the same marking and labeling requirements as SQGs and LQGs as a best management practice.

Please also note that the U.S. Department of Transportation has certain marking, labeling and placarding requirements that may apply independently of Connecticut's hazardous waste regulations (see, for example, 49 CFR 172 and 173).

**6) Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped to a hazardous waste landfill on a bill of lading?**

LQGs and SQGs in Connecticut must ship hazardous crushed lamps using Connecticut's 8-part hazardous waste manifest. CESQGs in Connecticut may ship such lamps on a bill of lading, but, just as with LQGs and SQGs, any transporter they hire to haul the waste must have an EPA ID number and a current, valid transporter permit in the State of Connecticut.

**7) Must the full drums be sent for recycling?**

Although we would recommend that drums of hazardous crushed lamps be recycled as a best management practice, such drums are not required to be sent for recycling. As noted in response #4 above, they may be sent instead to a hazardous waste landfill (or, in the case of a CESQG, to an out-of-state municipal waste landfill that is allowed to accept such waste). Such wastes may also be sent to a permitted hazardous waste treatment facility. In addition, CESQGs may take their waste to a household hazardous waste ("HHW") collection facility or a one-day HHW collection event which is permitted by DEP to accept CESQG waste.

**8) Can the recycling process of the crushed fluorescent lamp by-product be performed out of state?**

Once again, please note that DEP considers crushed and uncrushed fluorescent lamps to be spent materials, not by-products. That having been said, the recycling of crushed fluorescent lamps may be performed out of state, provided all applicable RCRA regulations are met before and during the shipment of the waste. In addition, if the receiving facility stores hazardous crushed lamps before recycling them, it would have to have a RCRA storage facility permit.

**9) How should the generator label the drums before they are sent for recycling?**

A generator in Connecticut that sends their hazardous crushed lamps for recycling must label the drums in the same manner as when they are being sent for disposal (see response #5 above).

**10) Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped for recycling on a bill-of-lading?**

A generator in Connecticut that sends their hazardous crushed lamps for recycling must comply with manifesting requirements in the same manner as when they are being sent for disposal (see response #6 above).

**11) What determines if a facility is considered a "conditionally exempt small quantity generator"?**

In Connecticut, a generator is regulated as a CESQG if it generates no more than 100 kilograms of hazardous waste (or 1 kilogram of acute hazardous waste) per calendar month, and accumulates no more than 1000 kilograms of hazardous waste (or 1 kilogram of acute hazardous waste) on-site at any one time.

**12) Can a "conditionally exempt small quantity generator" transport their waste on a bill of lading to a permitted recycling facility?**

It is not clear whether this question pertains to self-transportation of wastes by CESQGs, or to the use of a bill of lading, or both. As a result, both of these issues are addressed below.

With respect to the issue of self-transportation, a CESQG may self-transport its own hazardous waste, provided that the waste is transported in vehicles owned by the generator in quantities of less than 1000 kilograms of hazardous waste per calendar month, and provided that the waste is taken to a facility which is permitted by DEP to accept such waste.

With respect to the issue of the use of bills of lading for CESQG shipments, the result is the same as in the case of disposal (see response #6 above).

**13) If the generator is termed a "conditionally exempt small quantity generator," can the generator send their crushed by-product to an approved landfill located in your state?**

See responses #3 and #6 above.

**14) Who at your office should be contacted if more clarification is needed?**

You may contact Ross Bunnell of the Waste Engineering and Enforcement Division at (860) 424-3274 if you have further questions regarding lamp crushing and the management of crushed lamps. In addition, you may also call DEP's toll-free compliance assistance telephone number at (888) 424-4193 if you have general questions regarding hazardous waste issues.

**ATTACHMENT 4**

**April 16, 2002 Atty. Kaiser Letter**

STEVEN P. KAISER  
Attorney At Law

39 S. LaSalle Street, Suite 404  
Chicago, Illinois 60604

312/641-1117 (Phone)  
312/641-2531 (Fax)

April 16, 2002

Mr. Richard J. Barlow  
Director, Waste Management Bureau  
Connecticut Department of Environmental Protection  
79 Elm Street  
Hartford, CT 06106-5127

RECEIVED

APR 24 2002

OFFICE OF BUREAU CHIEF  
WASTE MANAGEMENT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Re: Regulations Governing The Crushing Of Fluorescent Lamps

Dear Mr. Barlow:

I represent Air Cycle Corporation, the manufacturer of The Bulb Eater lamp crushing system. Air Cycle Corporation has been contacted by numerous Connecticut facilities interested in purchasing The Bulb Eater. These prospective purchasers would like some assurance that the State of Connecticut will allow them to operate The Bulb Eater system without requiring them to obtain a permit under the Resource Conservation and Recovery Act.

I am writing to request that the Connecticut Department of Environmental Protection confirm that RCRA generators who generate wastes which may include spent fluorescent lamps may crush the lamps on-site without obtaining a treatment permit under RCRA pursuant to the so-called "accumulation tank exemption." In an undated letter to Air Cycle, Connecticut stated that generators may crush lamps on-site without obtaining a permit. I am enclosing a copy of that letter. I am also enclosing letters from the States of Arizona, Kansas, New Jersey, New York, Michigan, Oklahoma, Nevada, and Utah in which these states acknowledge that RCRA generators may crush fluorescent lamps on-site without a RCRA treatment permit.

I have reviewed a Department Of Environmental Protection Intra Departmental Memorandum dated October 3, 1991, and entitled, "Small/Large Quantity Generators, Treatment in Accumulation Containers and Tanks." In the Memorandum, the Department stated that, "treatment in accumulation tanks or containers without a permit is permissible under the existing rules, provided the tanks or containers are operated strictly in compliance with all applicable standards." The Memorandum went on to enumerate the applicable federal standards. In addition to the applicable federal standards, the memorandum also set forth five supplemental standards promulgated by the State of Connecticut. I have set forth below these five standards. I have also described the manner in which The Bulb Eater meets these standards.

- 1. Treatment in accumulation tanks and containers shall not occur if such treatment results in a release of hazardous constituents to any environmental media (air, water, or soil). DEP discourages treatment activities which essentially shift pollution from one environmental media to another.**

The Bulb Eater filtration system captures 99.98 percent of the mercury vapor released during crushing. The high capture rate means an operator of the Bulb Eater could crush over 200 lamps before exceeding the amount of mercury vapor released by the accidental breakage of a single lamp. This rate of capture is also comparable to the capture rate of permitted fluorescent lamp recycling facilities.

In contrast, intact spent fluorescent lamps sent to a municipal landfill, hazardous waste landfill or recycling facility frequently break during transport and handling, releasing about 6.8 percent of the total mercury content of the broken lamp into the atmosphere.<sup>1</sup> Even if the lamps arrive at the landfill intact, the landfill operator routinely crushes the lamps during compaction activities releasing vapors into the atmosphere and mercury solids into area groundwater.

Air Cycle Corporation promotes recycling among its customers. It arranges for the transportation of the drummed wastes to permitted recycling facilities and, at the time of pick up, provides clean, high quality replacement drums for the further accumulation of crushed lamps. Persons who use The Bulb Eater system confer a benefit on the environment by diverting lamps from landfills to permitted recycling facilities. Use of The Bulb Eater system also reduces emissions during transportation because the crushed lamps are transported in tightly sealed drums while intact lamps are often shipped in loosely sealed cardboard boxes making the lamps subject to accidental breakage.

- 2. Treatment in accumulation tanks and containers shall not occur if there is a significant likelihood that such treatment of wastes would pose a hazard by producing or resulting in an explosion, a fire, or the generation of toxic mists, fumes, dusts, or gases.**

The use of The Bulb Eater does not pose a hazard. The Bulb Eater captures over 99.98 percent of the mercury vapor content from the crushed lamps which results in an 8-hour time-weighted average mercury exposure of 0.002 mg/ m<sup>3</sup> per drum of 450 lamps, a level of exposure which is far below the OSHA regulated level of 0.1 mg/m<sup>3</sup>. Significantly, The Bulb Eater exceeds the OSHA standard even while crushing 450 lamps in an 8 hour period, an amount of lamps Air Cycle believes to be far greater than the amount most handlers crush in an 8 hour period.

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<sup>1</sup> Federal Register, July 6, 1999, Volume 64, Number 128, Page 36471.

3. Ideally, treatment in accumulation tanks and containers should occur only at the time wastes are first placed in containers. (Treatment practices employed at a time after hazardous waste have been placed in a container may pose a hazard as such containers must be opened. The opening of containers of hazardous wastes can be hazardous because of accidental ignition of ignitable waste, accidental reaction of reactive wastes, or the release of toxic gases. While such dangers can presumably be avoided by employing sophisticated container opening devices designed to prevent such hazards, DEP cannot assume that these safeguards will always be employed. Without these safeguards, the absence of potential hazards cannot be assumed or guaranteed. This is consistent with 40 CFR 270.1(c)(2)(vii) and its preamble published in Volume 47, No. 38 of the Federal Register (Thursday, February 25, 1982).

Persons operating The Bulb Eater crush the lamps only at the time the lamps first enter the drum. The mercury vapors are captured in the filtration system and the remaining crushed lamps are stored in a 55 - gallon drum.

4. Treatment in accumulation tanks or containers shall only occur where there is an environmental benefit associated with such treatment.

Persons who use The Bulb Eater system confer a benefit upon the environment. Persons who do not use the Bulb Eater store and transport lamps in bulky, cardboard boxes. The lamps within the boxes often break while in storage or during transport resulting in uncontrolled releases of mercury to the environment. By way of comparison, a person who uses the Bulb Eater can crush 200 lamps before releasing a quantity of mercury equal to that released by the accidental breakage of a single lamp.

Persons who in the past may have disposed of spent lamps in landfills find The Bulb Eater system a safe and cost-effective way to start recycling their lamps. They see the machine as the ideal way to handle or package their lamps prior to recycling. Current users report saving roughly 20 hours of labor per 1000 lamps by crushing the lamps with the Bulb Eater as opposed to manually boxing intact lamps. By using the system, users are able to dramatically reduce the volume of waste by compacting the spent lamps into sealed 55-gallon drums which hold up to 1350 four foot long lamps. The crushed lamp fragments can be shipped more safely and economically than intact lamps because the lamp fragments are contained within a sealed, steel 55-gallon drum rather than a taped cardboard box. The crushed lamp fragments are also more easily recycled than intact lamps by many lamp recycling companies. The recycling facilities used by Air Cycle can process crushed lamps faster and with less labor than is typically required to recycle intact lamps.

Crushing lamps on-site is safe and cost-effective, leading to a higher rate of recycling. Air Cycle Corporation encourages its customers to recycle by offering to its customers a nation-

wide recycling services for both crushed and intact lamps, ballasts, batteries, and computer hardware.

**5. The generator shall ensure that all employees are thoroughly familiar with proper waste handling and emergency procedures, relevant to their waste treatment responsibilities.**

It is not difficult for generators to ensure that employees who operate The Bulb Eater are thoroughly familiar with the proper procedures for operating The Bulb Eater system. The generators who would qualify for the accumulation tank exemption are already responsible for complying with the applicable RCRA generator regulations. These regulations include requirements pertaining to personnel training, container management, preparedness and prevention, contingency plans, emergency procedures, manifesting, record keeping, and reporting requirements.

The Bulb Eater is safe and simple to operate. The fluorescent lamp is fed into the machine which maintains a significant vacuum. Within the drum, the machine crushes the lamp into very fine fragments. The dust and vapors are drawn out of the drum through a HEPA filter. The HEPA filter captures all particulate matter down to .3 microns. The vapors containing mercury pass through the HEPA filter, but are captured in a scientifically designed activated carbon filter. The activated carbon within the filter is specifically formulated to virtually eliminate all gaseous emissions of mercury.

By use of expensive activated carbon, which is laced with yellow sulfur, the mercury vapors are captured and chemically combined with the sulfur to form mercuric sulfide, a non-soluble mineral. This special activated carbon is used by natural gas pipeline companies to remove mercury vapors from gas as it leaves gas wells. It is a well-proven and particularly effective technology. It also has a remarkable capacity for adsorbing mercury; it can hold roughly 25 percent of the carbon weight in mercury or 5.5 pounds of mercury before saturation.

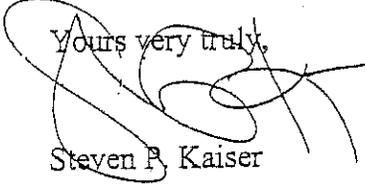
\* \* \* \* \*

In closing, Air Cycle Corporation believes it has developed a product and an array of support services which together have the potential to reduce mercury emissions from spent fluorescent lamps to the environment. Many facilities in Connecticut have expressed an interest in using the product. Air Cycle Corporation would like to introduce The Bulb Eater to Connecticut. As it does so, it would like to be able to represent that persons can use The Bulb Eater without obtaining a RCRA permit so long as they comply with all applicable federal and state standards. A statement from the Department to this effect would be very much appreciated by both Air Cycle Corporation and the regulated community in Connecticut.

Mr. Robert J. Barlow  
Connecticut Department of Environmental Protection  
April 16, 2002  
Page 5

If you have any questions or require additional information, please do not hesitate to call. I may be reached at (312) 641-1117. You are also invited to visit Air Cycle Corporation's website at [www.aircycle.com](http://www.aircycle.com) for more information about its products and services.

Yours very truly,

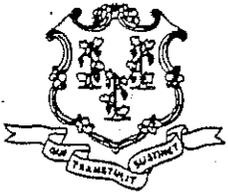


Steven P. Kaiser

SPK/spk  
Enclosures  
cc: Air Cycle Corporation

**ATTACHMENT 5**

**Undated DEP Letter from Robert Isner (Circa December, 1999)**



STATE OF CONNECTICUT  
DEPARTMENT OF ENVIRONMENTAL PROTECTION



Mr. Scott Beierwaltes  
Air Cycle Corp.  
513 North Fourth Avenue  
Maywood, IL 60153

Dear Mr. Beierwaltes:

Thank you for your letter dated October 20, 1999 regarding fluorescent lamp regulations in Connecticut. DEP supports your efforts to ensure that your product and the hazardous wastes generated from this process are properly managed in the State of Connecticut.

For your clarification, DEP does not consider the crushed fluorescent lamp to be a by-product. Instead, DEP clearly sees the crushed fluorescent lamps defined as wastes, and therefore must be managed as wastes.

DEP would also like to make you aware of State specific requirements. Connecticut has further requirements for non-RCRA hazardous wastes - Connecticut Regulated Waste (CRW) and Special Wastes. These wastes are more stringently regulated in Connecticut due to state specific concerns regarding wastes such as mercury.

The following are responses to your fourteen questions regarding fluorescent lamp regulations in Connecticut.

**1) Is "controlled" or "closed cycle" crushing of fluorescent lamps, to reduce volume and handling, acceptable to your state's Hazardous Waste Division?**

Connecticut allows for treatment in tanks in containers according to the enclosed 1992 policy on this issue.

Please note that there must be a recognizable environmental benefit under the treatment in tanks and containers as described in 2.d. of the policy. Examples include, a process that must reduce the volume of the waste shipped off-site, make the waste more amenable for recycling and render the waste non-hazardous thereby eliminating or minimizing environmental hazardous associated with the transport and disposal of the waste.

Any other type of crushing of fluorescent lamps would be considered treatment of hazardous waste and would require a hazardous waste treatment permit. Please contact David Sattler of the Permitting Division at (860) 424-2134 for more information regarding permitting requirements.

**2) What is the crushed fluorescent lamp by-product considered in your state? Hazardous, Universal, or Special Waste?**

Again, DEP considers the crushed fluorescent lamp to be a waste, not a by-product. At this time, the Universal Waste Rule has not been adopted in Connecticut. Any waste that is determined to be hazardous according to Code of Federal Regulations (40 CFR 262.11) must be managed as a hazardous waste.

**3) Can the drums be sent to a municipal landfill? Under any conditions?**

Under no circumstances may drums exhibiting hazardous characteristics or its hazardous waste contents be sent to a municipal landfill in Connecticut. No RCRA hazardous wastes generated by industry are allowed at municipal solid waste landfills in Connecticut.

If the drums and waste are determined to be non-RCRA hazardous, a generator may apply for a Special Waste Authorization. Waste analysis would be required to be submitted to DEP before an approval would be granted to the landfill accepting the special waste. For more information regarding Special Waste Authorizations, please contact Pat Cam at (860) 424-2125.

**4) Can they be sent to a hazardous waste landfill?**

There are no RCRA hazardous waste landfills in Connecticut. If the waste is hazardous, the company should contact the state where they anticipate disposing the waste for further information.

In addition, many landfills will not accept non-RCRA hazardous waste (Connecticut Regulated Waste). If the waste is determined to be non-RCRA hazardous, and you want to dispose the waste in Connecticut, you may apply for a Special Waste Authorization as mentioned previously.

**5) How should the generator label the drums before they are sent to a hazardous waste landfill?**

The generator should label the drums according to state and federal regulations. A copy of the Regulations of Connecticut State Agencies (RCSA) is enclosed for your review.

In addition, as a best management practice, generators should label drums of non-RCRA hazardous waste.

**6) Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped to a hazardous waste landfill on a bill of lading?**

Small quantity generators (SQG's) and Large quantity generators (LQG's) must ship all hazardous waste on a manifest. Conditionally exempt small quantity generators (CESQG's) may ship their waste on a bill of lading, but may only offer their hazardous waste to a transporter with an EPA I.D. number.

**7) Must the full drums be sent for recycling?**

At this time, the drums of waste do not need to be sent for recycling. In Connecticut, generators may still send these wastes for disposal out of state. However, one federal condition of the Universal Waste Rule is the waste is sent for recycling.

**8) Can the recycling process of the crushed fluorescent lamp by-product be performed out of state?**

Once again, DEP considers the crushed fluorescent lamps to be wastes, not by-products. Yes, the crushing of these waste fluorescent lamps may be performed out of state provided all RCRA regulations are met before and during the shipping of the waste. The generator should keep records on site verifying the type of waste sent for recycling, the company receiving the waste, and any information explaining the recycling process.

**9) How should the generator label the drums before they are sent for recycling?**

The generator must label the drums the same as hazardous waste being shipped off-site for disposal. In addition, Connecticut has more stringent state regulations requiring a description of the contents on the containers. The generator should include that the wastes are going for recycling. Again, as a best management practice, DEP strongly encourages containers of non-RCRA hazardous waste also be clearly labeled.

**10) Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped for recycling on a bill-of-lading?**

If the drums of crushed fluorescent lamps are hazardous, SQGs and LQGs must ship their wastes as hazardous on a hazardous waste manifest. CT CESQGs are not required to use manifests, although most transporters will not ship hazardous waste without one. If CESQGs do not transport their own waste, they may only offer their waste to a transporter with an EPA I.D. number.

**11) What determines if a facility is considered a "conditionally exempt small quantity generator"?**

A CESQG generates less than 100 kilograms of hazardous waste (or less than 1 kg of acute

hazardous waste) per calendar month. A CESQG guidance document is enclosed for your review.

**12) Can a "conditionally exempt small quantity generator" transport their waste on a bill of lading to a permitted recycling facility?**

A CESQG may self transport its own hazardous waste. It must be transported directly to a permitted Treatment Storage and Disposal Facility.

**13) If the generator is termed a "conditionally exempt small quantity generator," can the generator send their crushed by-product to an approved landfill located in your state?**

If the crushed lamp is RCRA hazardous, it is illegal to send it to any municipal solid waste (MSW) landfill located in CT. If the crushed lamp is non-RCRA hazardous, it could be considered a Special Waste, and the company may apply for a special waste authorization for disposal in Connecticut as referenced in Question #3.

**14) Who at your office should be contacted if more clarification is needed?**

You may contact MaryAnn Nusom Haverstock of the Waste Engineering and Enforcement Division at (860) 424-3347 if you have further questions regarding your product and service. In addition, DEP also has a toll-free compliance assistance telephone number (888) 424-4193 for further general questions regarding hazardous waste issues that you may have. The answers in this letter have been based only on your October 20, 1999 correspondence to the Department. The answers may be further clarified if more information or other interpretations are found at a later date. Connecticut's hazardous waste program incorporates the Code of Federal Regulations with some more stringent areas. A copy of the Regulations of Connecticut State Agencies, the more stringent state regulations, has been enclosed for your review.

Sincerely,



Robert C. Isner  
Assistant Director  
Waste Engineering and Enforcement Division

# Air Cycle Corp.

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Scott Beierwaltes • 513 North Fourth Avenue • Maywood, IL 60153  
Tel (708) 344-7860 • Fax (708) 344-7875 • E-mail scottb@aircycle.com

October 20, 1999

Ms. Maryann Haverstock  
D.E.P.  
79 Elm St 4th Fl  
Hartford, CT 06106

Dear Ms. Haverstock:

We are requesting help in understanding the fluorescent lamp regulations for your state.

Air Cycle Corporation is a manufacturing company located in Maywood, Illinois (just outside of Chicago). We manufacture a lamp-crushing machine. This lamp crusher is somewhat unique in the sense that it uses a technology to control the emissions from the crushed lamps. The machine is an apparatus that is clamped to a 55-gallon drum. (See accompanying flier) Our machine named the "Bulb-Eater" has a H.E.P.A. filtering system to filter the contaminated dust and also an activated carbon canister to capture (and neutralize) mercury vapor. The crushing itself occurs within the drum used for storage. Using this technology, the machine has been tested for OSHA compliance. The results showed that a generator could safely crush roughly 1600 four-foot lamps per 8-hour day and still operate well within OSHA requirements for safety.

Air Cycle Corp. manufactures the machines at our facility located in Maywood. In addition to the manufacturing, we are currently offering a complete lamp disposal service. The end-user purchases our "Bulb-Eater" to crush the lamps. Once the lamps are crushed, we also offer removal/ recycling service for our customers. Based on our customers' volume of spent lamps, we have negotiated discounted rates through a nationwide recycling company.

Once the 55-gallon drum is full of crushed lamps, the customer takes our apparatus off of the drum, replaces the filters, and places the old filters onto the crushed glass inside the 55-gallon drum. Once the filters are placed in the drum, the drum is sealed and a shipping ring clamps the lid to the drum. From that point, the generator can label the drum however the regulations indicate. Once this process is complete, the generator calls our toll-free customer support phone number to schedule the pick-up of their drum and/ or intact lamps for recycling. We schedule the pick-up with a nationwide recycling company. The process is nice and clean for the customer and typically less than what they are currently paying or would pay.

Air Cycle Corp. is aware that the regulations concerning lamp disposal and lamp crushing vary state to state. The purpose of this letter is not only to make you aware of our technology, but also to clarify regulations. Our customers frequently ask the following questions. Please respond to these questions in writing and forward your response to us as soon as possible.

**RECEIVED**

NOV 01 1999

1. Is "controlled" or "closed cycle" crushing of fluorescent lamps, to reduce volume and handling, acceptable to your state's Hazardous Waste Division?
2. What is the crushed fluorescent lamp by-product considered in your state? Hazardous, Universal, or Special waste?
3. Can the drums be sent to a municipal landfill? Under any conditions?
4. Can they be sent to a hazardous waste landfill?
5. How should the generator label the drums before they are sent to a hazardous waste landfill?
6. Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped to a hazardous waste landfill on a bill of lading?
7. Must the full drums be sent for recycling?
8. Can the recycling process of the crushed fluorescent lamp by-product be performed out of state?
9. How should the generator label the drums before they are sent for recycling?
10. Can the 55-gallon epoxy-lined drums of crushed fluorescent lamps be shipped for recycling on a bill-of-lading?
11. What determines if a facility is considered a "conditionally-exempt small quantity generator?"
12. Can a "conditionally exempt small quantity generator" transport their waste on a bill of lading to a permitted recycling facility?
13. If the generator is termed a "conditionally exempt small quantity generator," can the generator send their crushed by-product to an approved landfill located in your state?
14. Who at your office should be contacted if more clarification is needed?

Once again, I appreciate your assistance in helping Air Cycle Corp. and our customers understand your regulations more clearly. Many of our customers would like to become compliant with your regulations, but simply do not know exactly what is expected of them. Hopefully, our machine and recycling service will help make proper disposal easier for the facilities located in your state. By reducing storage and handling hassles, and also reducing cost, we feel that we are offering facilities a valuable product and service.

Should you have questions, please feel free to contact me via phone, fax, or e-mail.

Thank you.

Sincerely yours,

Scott Beierwaltes  
Marketing Director

Introducing...

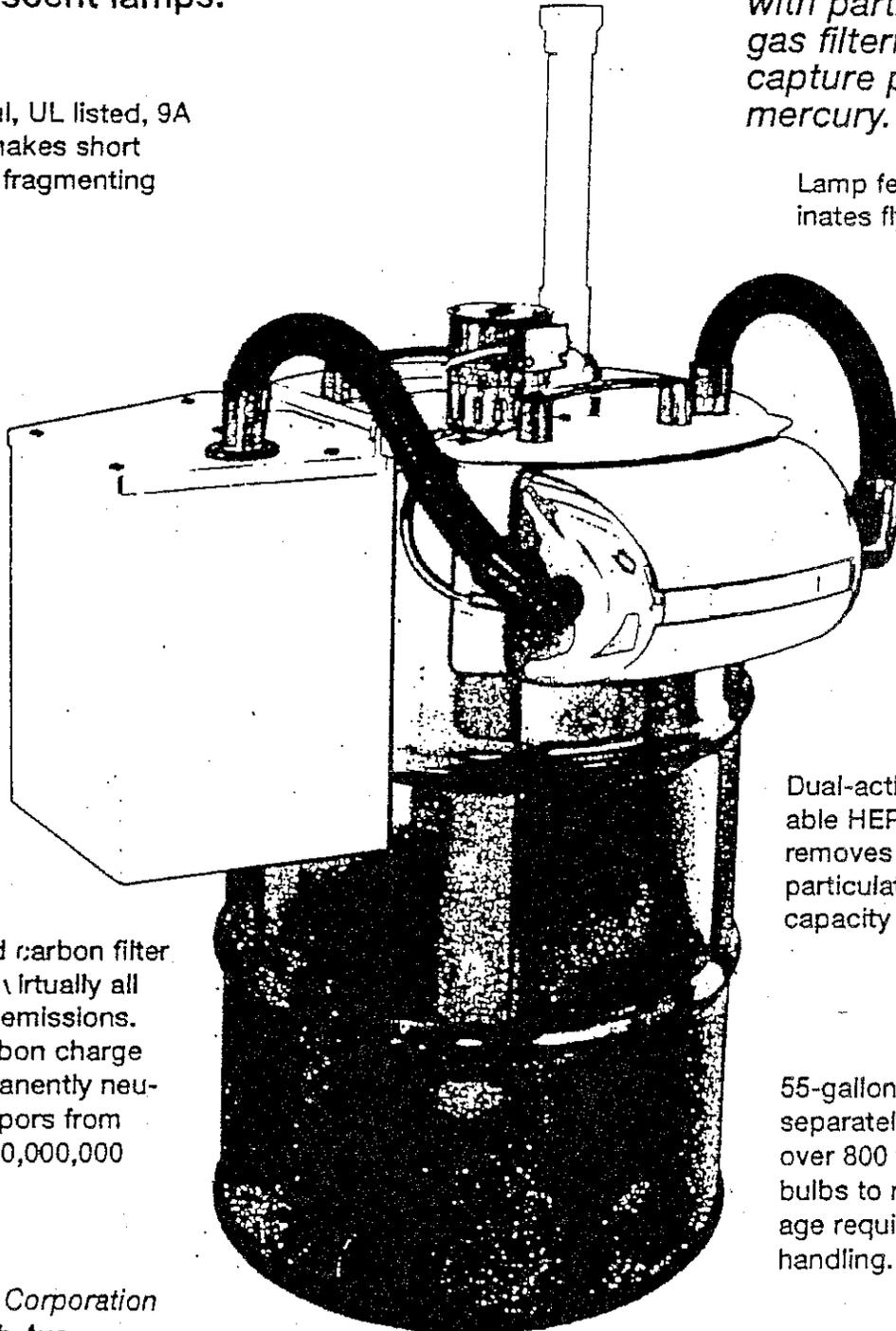
# The Bulb-Eater™

The safe, efficient way to crush fluorescent lamps.

Powerful, UL listed, 9A motor makes short work of fragmenting bulbs.

Model BE-55-VRS  
(Vapor Removal System)  
*with particulate and gas filtering system to capture poisonous mercury.*

Lamp feed tube eliminates flying glass.



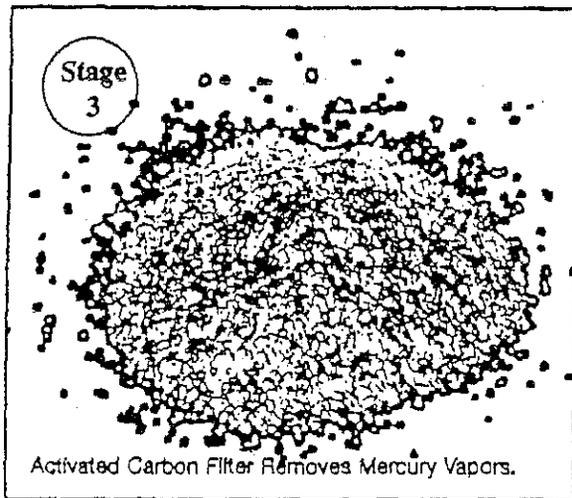
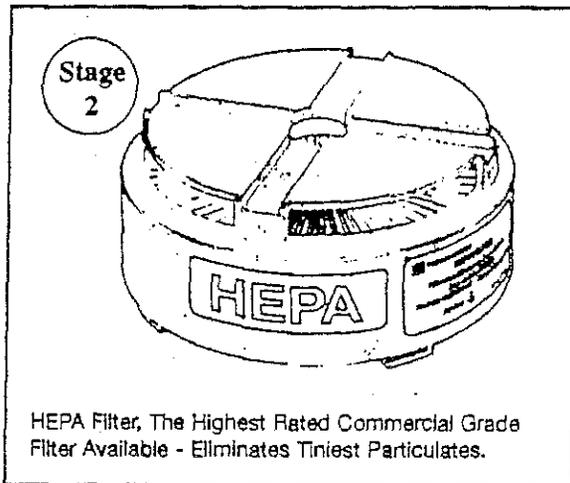
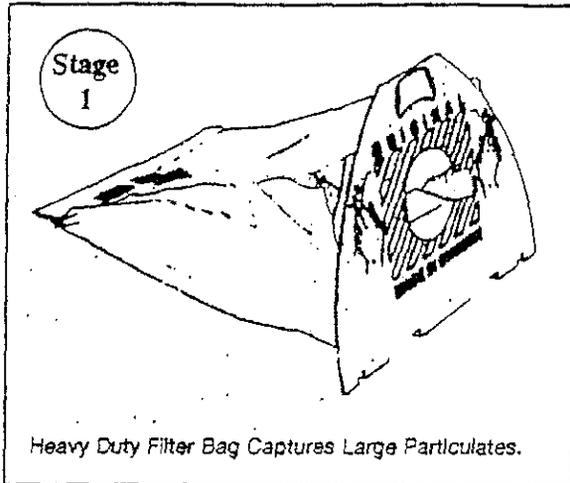
Activated carbon filter removes virtually all gaseous emissions. Each carbon charge will permanently neutralize vapors from roughly 10,000,000 bulbs.

Dual-action, replaceable HEPA filter removes virtually all particulates with high capacity vacuum unit.

55-gallon drum (sold separately) will hold over 800 fragmented bulbs to reduce storage requirements and handling.

Air Cycle Corporation  
513 N. 4th Ave  
Maywood, IL 60153  
Tel: 800-909-9709  
Fax: 708-344-7875

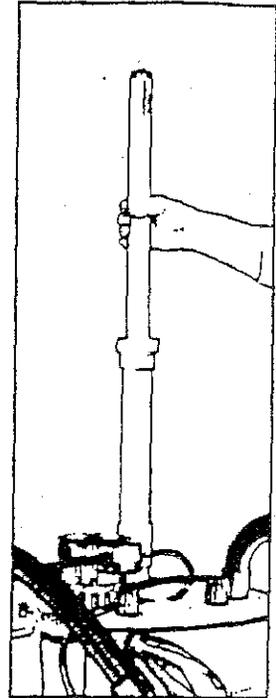
# The Bulb Eater's Three-Stage Filtering and Micro-Shard Fragmenting Combine To Make Fluorescent Bulb Disposal Safe, Easy and Convenient.



The Bulb•Eater BE-55-VRS from Air Cycle Corp. is the ONLY fluorescent tube disposal unit on the market that can satisfy the needs of large-scale users. Able to transform over 800 bulbs from a huge unwieldy pile of dangerous and difficult-to-dispose-of lamps to an easily manageable 55-gallon drum, the BE-55-VRS uses a three-stage filtering system to remove harmful particulates and gas. The shards produced by the BE-55-VRS are tiny and compact.

The filtering elements are easily and inexpensively replaced after very long service lives. The carbon charge will last for over ten million 4' bulbs, permanently neutralizing the mercury vapor.

Stop worrying about fluorescent tube disposal, call Air Cycle today to order your Bulb Eater and learn more about our drum pickup services.



### Specifications:

Drum (sold separately) . . . . .	55 gal.
Collection Capacity . . . . .	800 4' Bulbs
Motor . . . . .	9 amps, 120/240V
Dust Filter . . . . .	30-60 cfm, 2-stage HEPA
Vapor Filter . . . . .	Active Carbon
Price (MSRP) . . . . .	\$1,895.00

## The Bulb•Eater®

Distributed By:

Air Cycle Corp • 513 N. 4th Ave. • Maywood, IL 60153 • 800-909-9709

ATTACHMENT 6

June 27, 2002 Hazardous Waste Management Regulations