GRANULAR RE-ACTIVATED CARBON

The Re-Workhorse Of The Water Treatment Industry

By C.F. "Chubb" Michaud

Sometimes the best way to dispose of spent GAC is "never."

In earlier studies, we learned that water is the universal solvent. That is: just about everything is soluble to some extent in water. It's no wonder that we're still discovering just what really *is* dissolved into our water supplies.

In our three-part series on granular activated carbon (GAC) appearing in *WC & P's* June, July and August 1988 issues, we learned that GAC is the universal adsorbent. That is: just about everything that is soluble in water is adsorbed to some extent by GAC. In fact, contaminants which may be contained at non-detectible levels in feed waters may show up as significant constituents in the spent carbon. This brings up an interesting question: Is spent GAC considered hazardous waste and how does one properly dispose of it?

The purpose of this two part series is to offer guidelines to GAC users as to the potential for generating a hazardous waste (knowingly or unknowingly) and to offer suggestions on the proper procedures for handling, storing, packaging, shipping and disposing of GAC.

Hazardous Waste

The laws concerning wastes and hazardous substance disposal are indeed complex. There is a base of federal regulations, often strengthened by state, county and/or local codes. Needless to say, there is not strict uniformity between and among the various agencies.

Waste is defined as any material no longer fit or usable for its original purpose (or as soon as it is removed from its original installation). Obviously, not all wastes are considered hazardous. The Code of Federal Regulations (CFR) Title 40, Part 261 identifies and lists hazardous substances. In general, *any substance capable of causing harm to man or to the environment may be considered hazardous* and may require carefully documented disposal.

Although CFR Title 40, Part 261 identifies certain specific chemicals as hazardous, there are innumerable exceptions and/or overriding regulations. For instance, residential wastes and nuclear wastes are exempt because they are covered by other regulations.

In addition to the listed substances, wastes may be considered as hazardous (1) by class (i.e. chlorinated solvents used for degreasing), (2) by source (i.e. plating rinses containing certain metals) or (3) by characteristic (i.e. corrosive, flammable or reactive).

Furthermore, the Environmental Protection Agency (EPA) defines hazardous wastes independent of concentration. There are, however, exceptions as to quantity depending upon how and where the waste was generated. Does this mean that two essentially identical "wastes" may be classified differently (one as hazardous, one as not) if they are generated by different means, or by different generators, or in different states? *The answer is yes.*

> *Laws governing hazardous wastes differ from state to state.*

Is spent GAC hazardous waste?

We pointed out earlier that any substance capable of causing harm to man or the environment may be considered hazardous. Since GAC adsorbs organic substances from water, it is entirely possible that the GAC may be considered hazardous if the adsorbed substance is listed as hazardous or if the concentration of adsorbate renders the GAC flammable, corrosive or reactive.

Fortunately (and with a sigh of relief) most GAC used on residential applications where municipal water is supplied *would not be considered problematic.* The reason is simply that this spent GAC is (1) unlikely to contain specifically listed hazardous substances, or (2) is not flammable, corrosive or reactive and, (3) is not leachable by EPA defined test procedures or (4) is small enough in quantity (usually less than 220 lbs. - about four cubic feet) to be exempt.

It is the opinion of this author that the following GAC applications *would not result in the generation of a hazardous waste:*

1. Household drinking water POU countertop filters.
2. Small under-the-sink POU filters and reverse osmosis prefilters and post filters.
3. Commercial and industrial GAC filters such as reverse osmosis or DI prefilters used largely for the removal of chlorine, chloramine and THM precursors from municipally supplied waters (or wells having no known elevated levels of hazardous substances).

Non-hazardous waste is simply waste. It may be disposed of as ordinary waste. However, we would encourage the moderate users of GAC or dealers with portable exchange services or rebedding services to *consider a carbon reactivation process as a means of both recycling the GAC and preserving the environment.*

> *The environment benefits from the recycling of GAC - even if it is non-hazardous.*

Who is responsible for hazardous waste?

If your use for GAC is a use other than one of the three previous examples or if your specific use deals with the removal of toxics, flammables, corrosives, heavy metals, chlorinated solvents, PCB's, dioxin, radon or radioactive materials, *you would be considered a generator of hazardous waste.* As such, you are responsible for the proper disposal or destruction of that waste. You cannot assign the responsibility to anyone else nor can you simply store the waste on the back forty. There are well defined procedures for the handling, storing, packaging and transporting of hazardous wastes which will be described in Part II.

Is there a difference between regeneration of GAC and reactivation?

There are several "regeneration" techniques for GAC that have varying benefits depending upon the role of the GAC. Some of these techniques are effective and proven methods of restoring the adsorptive properties of GAC. Some are not:

Methods of Regenerating GAC

1. **Steam** - a good method for prolonging the

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utility of GAC. Moderate pressure steam is passed through the carbon bed for several hours and the condensate is collected, stripped (or separated) and the contaminant recollected. This is particularly useful where the contaminant is a moderate or highly volatile solvent and the concentrations are high. Eventually, the GAC must be reactivated due to the accumulation of low volatility components.

2. **Hot Water** - generally not very effective. However, on certain highly volatile solvents, this method will show some success. Hot water means 180°F or better.

3. **Solvent Extraction** - not a consideration for water treatment.

4. **Brine** - not effective - never was, never will be.

5. **Caustic** - may have some benefit on organics that have high alkali solubility. Must be acid neutralized after treatment. Eventually, the GAC should be reactivated.

6. **Reactivation** - an actual refiring or roasting of the spent GAC to burn off the contaminants. This is the best technique for restoring capacity

(Note - certain contaminants such as heavy metals will not be completely removed. The re-use of reactivated GAC for potable water uses is limited.)

Benefits of reactivating GAC

There are several benefits of reactivating spent GAC:

1. **Reactivated GAC is no longer a waste product.**
2. **Reactivated GAC is no longer hazardous**
3. **Reactivation is generally less expensive than disposal.**
4. **Reactivated GAC has resale and/or re-use value.**
5. **Reactivation spares the environment by encouraging proper "disposal".**
6. **Reactivation terminates the waste generators disposal responsibility.**

Are you a hazardous waste generator?

If you are a portable exchange dealer who sells a service of supplying GAC exchange tanks for the removal of hazardous substances from water, you may be considered a generator of hazardous waste (as well as the user who uses the service).

If you are under contract to rebed GAC filters and transport the spent GAC from the job site, you may be considered a hazardous waste generator.

If you are a user of GAC for an application known to contain potentially hazardous materials, you are probably considered a hazardous waste generator.

In any case, you should contact your local or state agency for clarification and proper handling. The *RCRA Hazardous Waste Handbook, 7th Edition*, Crowell & Moring contains a list of the state agencies to contact. A state-by-state listing begins on page 58.

Remember, it is the generator of hazardous waste

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who is responsible for its proper disposal.

There is no statute of limitations as far as time. In California, generators of waste "properly" disposed of nearly 50 years ago are still being held liable for re-disposal.

Furthermore, methods of disposal considered "safe" today may be deemed "unsafe" tomorrow. Again, you will be responsible.

Conclusion

Some, but not all GAC applications may result in the generation of hazardous waste. Portable exchange GAC service companies are potential generators, and it is the generator who is responsible (and liable). Household users of POU filters are generally not considered generators of hazardous waste if the filters are used on municipally supplied water. Commercial and industrial users of GAC for adsorption processes known to contain hazardous substances are generally considered generators of hazardous waste. Hazardous waste is potentially harmful to man and to the environment and must be disposed of properly.

The laws governing hazardous waste disposal ar very complex and very strict and are getting tougher every year. Some day they may extend to regulate th disposal of GAC for household and POU installations

Part II of this series will offer helpful guidelines and step-by-step procedures for the reactivation of spent GAC as a means of "disposal" and termination of liability. ❑

About the Author

Chubb Michaud, author of this four-part series, is a chemical engineering graduate of the University of Maine and has been involved in ion exchange water treatment for over 10 years. He is a founder of Systematix Co. of Brea, CA and represents Purolite Co. in the Western States.

State Hazardous Waste Management Agencies

Alabama	Dept. of Envir. Mgmt. Land Div./Hazardous Waste Branch Daniel E. Cooper (205) 271-7735
Alaska	Dept. of Envir. Conservation Div. of Envir. Quality/Air & Solid Waste David DiPraglia (907) 465-2666
Arizona	Dept. of Health Srvcs./Envir. Health Div. Office of Waste & Water Qual. Mgmt. Ira Domsky (602) 257-2317
Arkansas	Dept. of Pollution Control and Ecology Haz. Waste Div. John Ward (501) 502-7444
California	Dept. of Health Srvcs. Toxic Substance Control Div. Carl Palmer (916) 324-6564
Colorado	Dept. of Health Waste Mgmt. Div. Orville Stoddard (303) 331-4834
Connecticut	Dept. of Envir. Protection Haz. Waste Mgmt. Section Patrick Bowe (203) 566-8843
Delaware	Div. of Air and Waste Mgmt. RCRA Branch Alan Simpson (302) 736-4781
D.C.	Dept. of Consumer and Regulatory Affairs Pesticide and Haz. Waste Mgmt. Branch Angelo Tompros (202) 783-3193
Florida	Dept. of Envir. Regulation/Div. of Envir. Prog.; Solid & Haz. Waste Section Raoul Clark (904) 488-0300
Georgia	Dept. of Natural Resources Envir. Protection Div. John Taylor (404) 656-2833
Hawaii	Dept. of Health Envir. Protection & Health Services Div. Brian Choy (808) 548-6767
Idaho	Dept. of Health & Welfare/Div. of Envir. Haz. Material Bureau/Policy & Standards John Moeller (208) 334-5879
Illinois	Illinois Envir. Protection Agency Div. of Land Pollution Control Bill Child (217) 782-6760
Indiana	State Board of Health Div. of Solid & Haz. Waste Terry Gray (312) 243-5087
Iowa	Dept. of Natural Resources Solid Waste Permit Section Bruce Henning (515) 281-6807
Kansas	Dept. of Health & Envir. Bureau of Waste Mgmt. John Paul Goetz (913) 862-9360
Kentucky	Dept. for Envir. Protection Div. of Waste Mgmt. Pat Haight (502) 564-6716
Louisiana	Dept. of Envir. Qual./Office of Solid & Haz. Waste Haz. Waste Div. Tom Patterson (504) 342-1354
Maine	Dept. of Envir. Protection Bureau of Oil & Haz. Materials Control Alan Prysonka (207) 289-2651
Maryland	Dept. of Health & Mental Hygiene Office of Envir. Prog./Waste Mgmt. Admin. Bernard Brigham (301) 225-6520
Massachusetts	Dept. of Envir. Quality Engineering Div. of Haz. Waste Linda Benevides (617) 292-5782
Michigan	Dept. of Natural Resources Haz. Waste Div. Alan Howard (517) 373-2730

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