Rachel's Environment & Health News
#162 - Fine Particles - Part 5: Incineration Worsens Landfill Hazards
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Eighty percent of America's solid waste is buried in landfills--160 million tons of it each year. In the U.S., we currently have about 5,500 operating solid waste landfills.

After Love Canal made headlines in 1978, citizen groups began to focus their attention on the hazards of landfills; as opposition to new landfills mounted, some government agencies decided incineration was the best solution to the nation's garbage problem. The thinking went this way: landfills pollute groundwater and get citizens all steamed up; incinerators reduce the need for landfills; therefore incinerators make sense as a way of handling garbage.

Throughout the 1980s, however, evidence accumulated, indicating that incinerators make the landfill problem worse, not better.

Incinerators do reduce the amount of material that must be landfilled. If you put 1000 pounds of raw garbage into a solid waste incinerator, you end up with somewhere between 250 and 400 pounds of ash; the other 600 to 750 pounds has been released into the environment as gases and soot through the smoke stack. The reduction in volume (as distinct from weight) is even more dramatic; for every 1000 cubic feet of garbage entering an incinerator, only 100 to 300 cubic feet remain as ash. Thus an incinerator reduces the need for landfill space (volume), which initially makes incinerators seem beneficial. [The reduction of total waste volume is less than the 70% to 90% indicated here because many items, like building debris, old refrigerators, etc. are not candidates for incineration, so building an incinerator does not affect the need for landfill space to contain them.]

Incinerators do reduce the need for landfill space, but unfortunately they also increase the hazards of the material going into the landfill and therefore actually make the groundwater pollution problem worse. As this fact becomes more widely understood, citizens are focusing their opposition on landfills that accept ash from incinerators, thus making the political problems of solid waste disposal as bad as, or worse than, they were before incineration was proposed.

The key here is the physical change that occurs in the garbage as it passes through the incinerator. Garbage starts off composed of fairly large items (cardboard boxes, bread wrappers, newspapers, and so forth). Inside the combustion chamber, the garbage is broken down and transformed into billions upon billions of small pieces, called ash. We have written earlier (see RHWN #131, #132, #134, #136) about the important change that occurs with this transformation: the surface area of the garbage is greatly increased. Because a small item has a larger surface area, relative to its volume, than does a larger item, the effect of breaking garbage into small particles is to vastly increase its surface area.

For example, as we showed in RHWN #131 [revised], a one-pound lump of garbage (assuming it has a spherical shape and weighs the same as water) has a surface area of about 44 square inches - about the size of a large post card. However, if you break that pound of garbage into tiny particles, you will increase its surface area to 9900 square yards-about the area of two football fields.

This is important when you put incinerator ash into the ground, because items in contact with groundwater leach from their surface. The larger the surface area, the faster leaching can occur. Everyone knows this from their own experience. Think of a drip coffee maker. If you put coffee beans into a drip coffee maker without grinding them up, then pour hot water over them, you will get very weak, unsatisfactory coffee out the bottom. However, if you grind up the coffee beans (thus greatly increasing the surface area of the coffee beans, thus increasing the ability of water to contact the beans), you will get thick, dark, rich coffee out the bottom. The grinding has not changed the weight of the beans, but it has exposed more of the beans to the water. The same thing happens with landfill leachate as with coffee: "grinding up" the garbage (turning it into ash) by processing it inside an incinerator vastly increases the surface area of the garbage and thus makes it leach much more rapidly. What you get out the bottom is not a thin, weak leachate but a rich, strong leachate that is more toxic than the leachate would have been if you had leached raw garbage instead of ash.

What are the toxic components in leachate from ash? The principal toxic components are the heavy metals that were present in the original garbage. Although you have reduced the weight of the garbage (each 1000 pounds going in produces only 250 to 400 pounds of ash), you still have most of the heavy metals from the original garbage, only now they are in the ash. Because the incineration process has driven off non- metallic components, the heavy metals now represent a greater proportion of the waste than they originally did (in other words, their concentration has increased) and they are now in a much more leachable form because their surface area has vastly increased. Thus, an ash landfill associated with an incinerator is much more likely to contaminate groundwater with toxic heavy metals than is a landfill that accepts only raw garbage.

There are few ash landfills in operation today. Most people who operate incinerators are throwing the ash into municipal landfills, or are simply heaping it on the ground somewhere. The U.S. Environmental Protection Agency (EPA) has refused to take a position on whether incinerator ash is a "hazardous waste" as defined by the federal Resource Conservation and Recovery Act, or not.

However, there is ample reason to be concerned about the hazards of metals in landfill ash. Studies at Rutgers University (see RHWN #92) have shown that each ton of incinerator ash contains approximately 5.9 pounds of lead, 0.12 pounds of cadmium, 0.096 pounds of chromium, and 0.19 pounds of arsenic. The nation's 100 operating solid waste incinerators are, today, processing something like 45,000 tons of garbage per day, thus producing perhaps 14,600 tons of ash each day or 5.3 million tons of ash each year. Those 5.3 million tons of ash contain 31 million pounds of lead, 640 thousand pounds of cadmium, half a million pounds of chromium, and a million pounds of arsenic. Burying this material in shallow holes in the ground in rapidly leachable form is essentially guaranteed to create the next generation of Superfund sites.

Do ash landfills leach metals in toxic concentrations? In their excellent new book on incineration, WAR ON WASTE, Louis Blumberg and Robert Gottlieb report on an EPA study of three ash landfills (so- called ashfills or ash monofills): "The drinking water standard for lead was exceeded in eight of nine tests, and the average value at the three sites exceeded the lead standard [for drinking water] twelve- fold." They go on to say, "Another review of a New York State ashfill, monitored during its first year of operation, when leachate should be considerably lower than in future years, found that pollutant levels in the leachate already exceeded, in some cases dramatically, a number of drinking water standards for various substances." (Blumberg & Gottlieb, pg. 114)

The acidity (or alkalinity) of the ash can affect the rate at which metals leach out of it. Some companies add lime or other materials to the ash to reduce the rate at which it releases metals; this allows their ash to pass the EPA's "EP toxicity test" and thus avoids its designation as a "hazardous waste." This, however, merely demonstrates that the EP toxicity test is not the proper test for evaluating the hazard of these wastes. Since it is universally recognized that sooner or later all landfills will leak, and since metals never degrade, over the long haul it seems a certainty that toxic metals in finely-divided form (i.e., in the form of small ash particles) in shallow burial sites will contaminate the local environment.

Get: Louis Blumberg and Robert Gottlieb, WAR ON WASTE (Washington, DC: Island Press [1718 Connecticut Ave., NW, Suite 300, Washington, DC 20009; phone (202) 232-7933], 1989); $19.95.

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