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The Recycling of Chemical Waste

Rather than bury toxic chemicals new ways are found to use them in products.

By STEVEN J. MARCUS

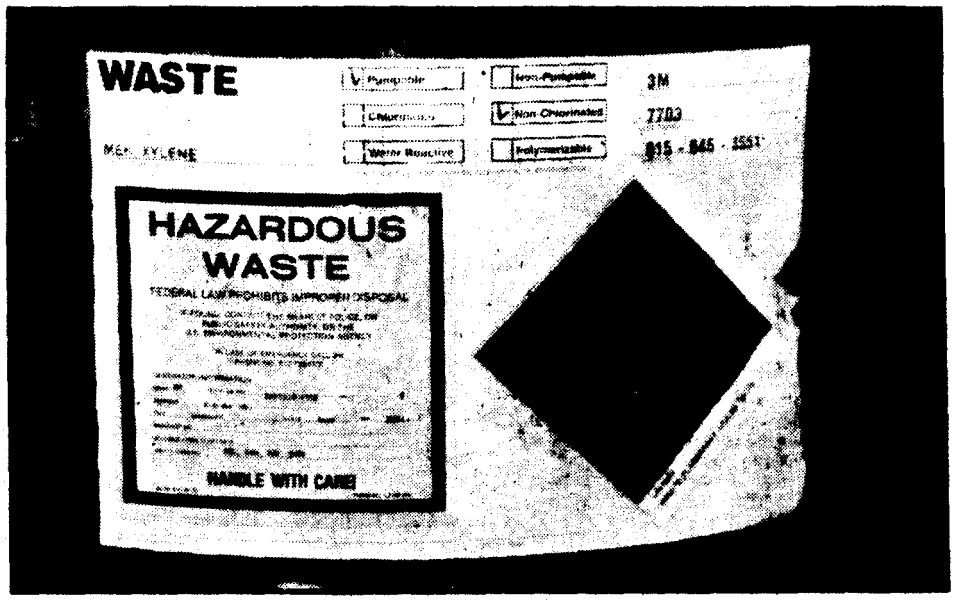
IN place of landscaping, huge and unsightly ponds surround the Allied Corporation's chemical plant in Metropolis, Ill., a rural town on the Ohio River. The ponds are filled with a dull white liquid, thick as oatmeal, that would begin to burn the skin off a hapless wader within minutes.

The substance is calcium fluoride, an unwanted byproduct of chemical manufacturing that has accumulated at the Metropolis plant for seven years as hazardous waste. To keep it from human contact indefinitely — as Federal law requires — a network of five ponds, each as large as a football field and 10 feet deep, was built across the nearby fields and woodlands and surrounded by fence.

But a year ago, the pond-building stopped and Allied took a new tack. It invested $4.3 million in a "recovery plant" that recycles the waste into a safe raw material for the production of commercially valuable fluorine-based chemicals that are a specialty of Allied's Metropolis plant. The result: Allied saves $1 million annually on new storage ponds and also because it no longer needs to purchase as much raw material.

Allied's strategy at Metropolis is being matched throughout the chemical industry. Increasingly, the hazardous waste problem is being dealt with by recycling the waste into raw material — or by investment in new equipment that produces less waste. The technologies involved are not new, but until recently they were considered too costly to use.

That has changed as Federal regulations governing hazardous waste disposal have become more stringent — and more expensive. The proliferating rules have pushed up storage costs for hazardous chemical waste from about $24 a barrel in the late 1970's to more than $100 a barrel today, according to James Gutensohn, commissioner of the Massachusetts Department of Environmental Management.



Warning label on barrel of hazardous waste, and a 3M Company incinerator for toxic chemicals.

The New York Times/Mitch Kezar

The industry has also been pushed into recycling by the public outcry over inadequate or careless storage of chemical waste. Most recently, for example, the Federal Environmental Protection Agency charged that trichloroethylene — a suspected carcinogen — might be seeping into the Minneapolis water supply from a landfill site in Fridley, Minn., where containers of chemical waste once were buried.

That sort of publicity has reinforced the industry's growing belief that investment in recycling plants will turn out to be less costly than settling future lawsuits filed by people claiming they had developed cancer and other ailments from contact with stored chemical waste. "The bottom line is the basic unpredictability in the quality and endurance of chemical storage," said Robert D. Stephens, chief of the Hazardous Materials Laboratory of the California Health Department. "That's something nobody wants to bet on."

Others agree. A report released last year by Congress's Office of Technology Assessment, for example, estimated that "cleaning up a site and compensating victims might cost 10 to 100 times today's costs of preventing releases of hazardous waste."

The new activity has begun to show impressive results, the industry claims. The Chemical Manufacturers Association estimates that its member companies now "recycle, reuse or reclaim about a half-ton of hazardous waste for every ton discarded." A recent C.M.A. survey of 535 plants operated by 70 chemical companies found that from 1981 to 1982 the amount of hazardous waste buried or stored in barrels and tanks went down by 59 percent. The total volume of hazardous waste disposed of through burial, storage and other methods fell 42 percent in that year for these plants, according to the C.M.A. survey.

A RECENT Congressional survey appears to disagree with these industry findings. Congress's Office of Technology Assessment estimated that 80 percent of the nation's hazardous waste continues to be buried in barrels and sealed containers or otherwise stored long-term. "It's still the cheapest alternative and therefore not all people are rushing in the new direction," says William Wallace, director of solid and hazardous waste management at CH2M Hill Inc., a consulting firm.

Theoretically, recycling could eliminate all the millions of tons of hazardous waste that the nation's industries produce each year, solving a major environmental issue. But in fact, decades will be needed even to approach this goal. For one thing, most of the nation's factories were not designed to recycle their byproducts. Converting those factories is costly. In addition, there is no standard recycling procedure. Each type of carcinogenic or toxic chemical waste requires different techniques and different equipment, says Douglas Shooter, a senior consultant in the hazardous waste management group of Arthur D. Little Inc., a consulting firm. "We end up with many examples — successes in smaller and smaller packages — that are not transferable to other wastes." Adds Bob Bonczek, director of environmental affairs at E. I. du Pont de Nemours & Company: "Each technique requires great imagination and persistence, and none is a panacea."

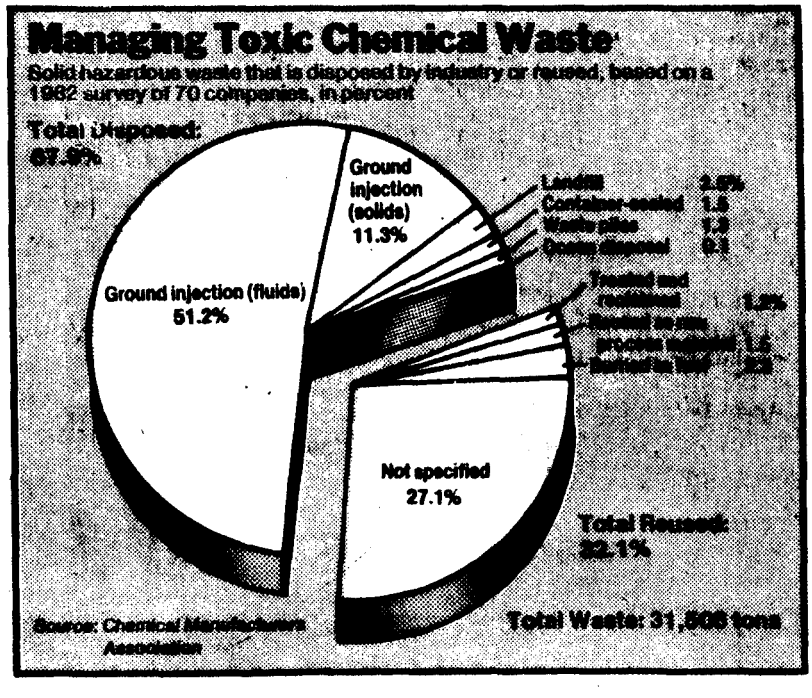
At its Metropolis, Ill., plant, Allied has managed to recycle all of the calcium fluoride thrown off as a hazardous byproduct of the fluorine-based chemicals made there to produce gases for refrigerators and air-conditioners. In fact, the company says that over the next decade, the network of pools in the nearby fields will be drained to feed the recycling plant and the land possibly restored. The Metropolis innovation earned Allied a National Environmental Industry Award last November, and the huge chemical company is also making changes at other plants. At Baton Rouge, La., for example, Allied dilutes acid waste, then mixes it with limestone to produce calcium chloride, a material used by the local oil and gas industries as a drilling fluid for rigs in the Gulf of Mexico. Before a recycling facility was built in 1981 to do this, 80,000 tons of chemical wastes were neutralized, the company said, and discharged into the Mississippi River.

At the Monsanto Company, which has its headquarters in St. Louis, the production of nylon spins off, as an unwanted byproduct, 30 million pounds a year of dibasic acid, a caustic material. It used to be stored in "deep-injection" wells, but now it is recycled and shipped to other plants as a raw material to make paints and solvents. It is also used in the scrubber systems of power plants to help reduce the emissions of sulfur dioxide into the air. The remaining dibasic acid is being concentrated and burned as a fuel, at a saving of $100,000 a year in Monsanto's fuel bill.

Earl Beaver, business development director for the Monsanto Fibers and Intermediates Company, estimates the company will sell five million pounds of recycled dibasic acid in 1984, for $1 million, enough to recover by 1985 the entire cost of the new recycling facility for the acid.

Mr. Beaver, who administers the company's Coproduct Utilization Program (Monsanto prefers to call the waste co-products rather than byproducts, he says, "because that implies additional value"), claims to have "found a home" in this manner for 70 million pounds of dibasic acid and other hazardous wastes thrown off last year by the manufacturing process.

STILL, Monsanto's 1983 waste storage bill was high — $30 million to store 300,000 tons of hazardous waste, although that was down from nearly 400,000 tons in 1980. Even with this volume decline, the



cost of hazardous waste disposal has tripled, from $[illegible] billion in the late 1970's, said Michael A. Pierle, Monsanto's director of regulatory management for hazardous waste. That is mostly a result of the cost of meeting Federal standards, he said.

The Minnesota Mining and Manufacturing Company estimates that 40 projects in its Pollution Prevention Pays program have eliminated 15,000 tons a year of hazardous wastes, yielding a total of $13.2 million in first-year savings. Sara Zoss, coordinator of the program, cites among example the reuse of ammonium sulfate, a caustic material that is a byproduct of the manufacture of such products as videotape. The chemical is now sold as a raw material for fertilizer, saving 3M about $1 million in pollution-control equipment and producing revenues of $[illegible],000 a year.

At 3M, a central incinerator in St. Paul burns 18,000 tons of hazardous waste a year, leaving a nonhazardous residue less than one-tenth the volume of the original material. The result has been savings in storage as well as a $1 million-a-year cutback in fuel costs.

Russell H. Susag, director of environmental operations at 3M, estimates that 90 percent of the company's hazardous wastes now are being eliminated, either through recycling or incineration. He said that the company's total cost of hazardous waste disposal has been reduced by as much as 75 percent, but he wouldn't cite dollar amounts.

Dow Chemical of Midland, Mich., also is recycling some hazardous wastes into useful products. Stacy Daniels, research leader in the company's Environmental Sciences Research Laboratory, talks of recycling "stillbottoms" from the production of caustic soda and chlorine into the useful raw material hydrochloric acid. But he says that Dow nevertheless relies on incineration to destroy most of its hazardous wastes.

Incineration is a major industry method of reducing the volume of hazardous wastes that must be stored indefinitely, with its attendant risk that seepage will contaminate the environment, creating future liability. But some experts say that incineration merely trades one type of pollution hazard for another. John Ehrenfeld, consultant in the hazardous-waste management group at Arthur D. Little, maintains that incineration "converts a small probability of high risk into low-level but continuous exposures" from air pollution emissions.

As for burial of waste in sealed containers, state legislation may eventually limit or end this alternative. California, for example, began last year to enforce a law that bans hazardous waste from landfills, and similar bans may soon appear at the national level. The Federal Resource Conservation and Recovery Act of 1976 is currently up for renewal in Congress, and experts predict a new law will most likely emerge that specifically prohibits the burial of some hazardous wastes.

EVEN in its present version, the Resource Conservation and Recovery Act has been a catalyst for change. The reduction of hazardous waste through recycling or incineration, said Mr. Stephens of the California Health Department, "is a very significant result of regulation."

Thus "some of the more forward-looking companies," Mr. Stephens said, "are sounding like environmentalists. People were calling us fuzzyheads a few years ago, but now companies like Getty, Dow and 3M, who know how chemicals behave and what to do with them, are speaking as we did."

In the last analysis, recycling or eliminating hazardous waste also depends heavily on a prosperous economy that will generate enough corporate revenue for the necessary capital investment, says Michael Overcash, professor of chemical engineering at North Carolina State University and a member of a National Academy of Sciences panel that is currently studying the hazardous waste issue. "The past few years haven't been too good for such investment," he says, "but the pace will quicken with recovery." ■