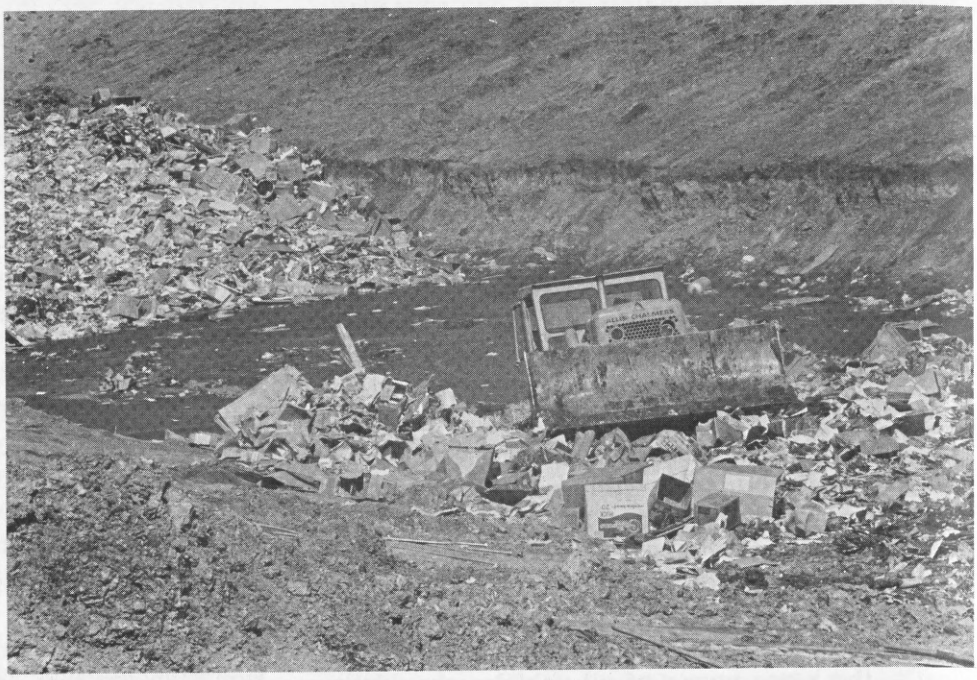

Sanitary landfill is one way to dispose of solid wastes.

THE SOLID WASTE CRISIS

Vyonne R. Bale

The Situation

Less than seven per cent of the world's population lives in the United States, yet these people consume nearly half of the earth's industrial raw material (3). This consumption generates enormous quantities of solid waste (trash and garbage). Each year Americans junk about 50 billion cans, 30 billion bottles and jars, 65 billion metal and plastic bottle caps, seven million automobiles and countless numbers of refrigerators, ranges, washing machines, bathtubs, sofas and furnaces (7). In addition, about 30 million tons of paper and 4 million tons of plastic are discarded each year (2).

The average American generates about six pounds of trash a day as compared with less than three pounds 50 years ago. By 1980, it is expected that the per capita refuse will amount to eight pounds daily or over a ton annually (3).

Present Disposal Methods

Solid waste disposal technology is very unsophisticated and has been overwhelmed by a dynamic industrial system in this country. Present methods of dealing with solid wastes are grossly inadequate. A large percentage of it is simply dumped on the ground, over a cliff, into a gulley or anywhere so it is out of sight and smelling distance. Of the refuse collected, 90 per cent is disposed of on the land (85 per cent in open dumps and five per cent in landfills), eight per cent is burned in incinerators, and the remaining two per cent is composted, dumped at sea or discarded in some other manner (4).

Open dumps are still a major disposal method in the more rural areas. They are not only aesthetically disasterous but also contribute to air pollution if burned, to ground water supply pollution by leeching, and are a health hazard because they serve as breeding grounds for rats, cockroaches and flies. Solid wastes have been associated with at least 22 diseases as well as numerous accidental injuries (13).

Sanitary landfills are used in many urban areas if enough land is available. In this method, refuse is compacted and covered with dirt. Ninety-four per cent of the 12,000 disposal sites in the United States have been labeled as "unacceptable" by the Department of Health, Education and Welfare (16).

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Today's throw-aways are creating a problem in sanitary landfills as many of them are non-degradable and do not readily compact. Two types of degradability pertain to solid wastes: chemical oxidation and biodegradability. Some wastes decompose by rusting and slowly lose their characteristic shapes by chemical oxidation, while others are attacked and reduced by bacteria and hence are considered biodegradable.

An experimental toboggan run and ski slope are being created from a mountain of refuse in DuPage County, Illinois. Garbage and trash are spread, firmly tampered and covered by a 6-inch layer of gravel and clay that controls decomposition and unpleasant odors. The process is continued until the desired mountain height is reached. Whether gas formation or poor compaction of some wastes will prevent success of this experiment remains to be seen.

Some landfill operations use compacting systems to convert anything from garbage to refrigerators into high density cubes before disposing of them in landfills or at sea.

Incineration is the best technique for reducing volume and weight of waste materials. Burning reduces volume and weight by some 60 to 80 per cent. The most important characteristic of material for burning is combustibility, while the amount of residue it leaves for further disposal is second.

With the exception of glass and metals, most materials will burn, but at different rates. Glass and plastics can be particularly troublesome in incinerators. At temperatures of 1,300 degrees F and above, glass may liquefy and deposit on incinerator walls. Plastics tend to create problems at lower temperatures. They melt, flow down into the grates, cool, solidify and clog the gratings. The heavier, rigid and flexible plastics, such as bottles and tubs, are the greatest problem. Light plastics, such as films, coatings and sacks, do not cause the same difficulty.

One of the major problems with most incinerators is the generation of off-gases, such as sulphur dioxide, which contaminate the air. Three-fourths of the 300 municipal incinerators in the United States do not meet the Bureau of Solid Waste Management's standards for refuse reduction or air pollution.

A small percentage of refuse is burned in individual incinerators located in homes, apartment buildings, small businesses and commercial establishments. Most of these are inadequate and produce a considerable amount of air pollution.

Some European and Japanese cities are harnessing the heat derived from incineration of wastes to provide steam for power to produce light and heat. Many American cities are expected to use this secondary energy source in the future.

Composting, a process best suited to disposal of organic matter, is another method of solid waste disposal. Waste materials are converted by bacteria into inert organic material for use as soil conditioners. Glass, metals and plastics cannot be disposed of by this method because they are not attacked and decomposed by bacteria.

Salvaging and recycling is the ideal method of handling solid waste. The salvage industry in the United States is composed of about 2,300 major companies doing gross sales of about $3 billion annually. They deal primarily with commercial and industrial wastes which are collected in relatively homogeneous form.

Potential salvageable wastes include such metals as aluminum, iron, steel and brass; rubber tires; paper and rags; some plastics; agricultural, garden and forestry wastes; oil; and glass. However, reprocessed materials cannot be used as before.

Principal barriers to recycling are expense and difficulty in separating solid waste. Most salvage companies cannot handle the heterogeneous materials found in residential wastes. The cost of sorting and shipping residential solid waste to salvagers is much greater than its returns. So far, no workable sorting techniques have been developed to segregate solid wastes.

A number of different sorting techniques, such as the coding of basic materials in manufacture and use of various magnetic sorters or modified air classification systems at the waste end of a product's cycle, are in the experimental stages. However, improved technology in the area of separation will have no practical effect unless salvaged materials can be sold and utilized.

The conversion of cellulose wastes derived from bagasse or sugar cane residue into crude protein by the oblong bacterium Cellulomonas has been accomplished by Louisiana State University engineers in a pilot study. Preliminary tests on farm animals suggest it also could be used as a human food additive. The cost of producing protein from this process should be competitive with the production of soybean flour at 14 cents per pound or corn meal at 10 cents per pound, and it is estimated to be cheaper than protein derived from petroleum.

Status of Specific Major Waste Contributors

Plastics are presently taking the brunt of environmental criticism. The problem of plastic discard parallels the increased use of plastic from 2.2 billion pounds in 1966 to an anticipated 6.3 billion pounds in 1976 (4).

Current systems of plastic disposal are ineffective. They are poor candidates for landfills as they neither deteriorate nor compact well. And because they are not biodegradable, plastics cannot be used for composting. Most incinerators are inadequately equipped to handle plastics from the standpoint of temperature as well as control of toxic gases produced during burning. The plastic industry is attempting to design incinerators equipped with scrubbers to prevent air pollution as well as to provide temperatures of over 2,000 degrees F to disintegrate plastic materials. Recovery, recycling and reuse of plastic is not technically or economically feasible at the present time, although there is some preliminary experimental work on recycled plastics for use in such items as wallboard, aggregates and tile.

The plastic industry is hopeful that research will find a method by which plastic can be recycled or find a completely new plastic that will readily degrade. A plastic beer bottle that turns to dust after being drained and discarded has been experimented with in Sweden. Sunlight's ultraviolet rays worked the transition. Scientists in the United States and other countries are working on similar bottles that will break down in sunlight and dissolve in water.

Ferrous metals are an economic and raw material drain as they are usually permanently lost in the solid waste stream. Millions of worn-out automobiles are abandoned in our city streets, mar the landscape in our rural areas and are piled four stories high in automobile graveyards. They not only contribute to the ugliness of cities and rural areas but also are a serious hazard to children who turn them into playgrounds. They are of value only to 15,000 companies involved in selling spare parts (9).

The scrap metal of the hulls is a tragic waste of valuable metal resources. Although a small effort is being made to recycle worn-out cars, there is a great need to recycle them into basic raw materials. Every ton of ferrous metal scrap used in steelmaking conserves up to 1½ tons of iron ore, a ton of coke and a half-ton of limestone.

Japan has developed a compression system to convert discarded autos into lumps of solid metal by means of heat and pressure. The United States also uses a continuous process that burns up unwanted non-metallic materials such as upholstery, glass and tires, while melting down the steel in automobiles. The Bureau of Mines and the Korbloch Corporation are working on a lightweight block formed by molding concrete around cores of compressed automobile scrap. Walls constructed of these blocks are said to have a load-bearing capacity comparable to that of walls built from heavier, solid concrete blocks.

Paper accounts for about 50 per cent of the litter in the United States. Much of this litter is packaging. Paper and paperboard dominate the packaging field with about 56.9 per cent of the total packaging by weight to be of paper by 1976 (10).

Perhaps more than any other major solid waste product, paper has been recycled and reused. Reclamation and reuse of each ton of paper stock spares 17 full grown trees and frees 3 2/3 acres of forest land for some other use (6). Not all paper is qualified for reprocessing. For example, the coating on magazines and the glue in paperback bookbindings foul up the process.

Paper is used extensively in disposable materials, such as paper sheets, pillowcases, mattress covers and gowns used by civilian hospitals. The big problem is how to get rid of these "disposables" in areas in which restrictions prohibit the use of less sophisticated forms of incinerators.

Glass, regardless of source, has been of little value in recycling, and efforts are being made to find a new use for it. The University of Missouri and the city of Owens, Illinois, are cooperating in an effort to use crushed, ground glass bottles as a substitute for sand, gravel and stone in the asphalt mix being applied to an 18-foot-wide strip of pavement at Owens. The glass is crushed to prevent tire cuts. Initial tests indicate that the new glassphalt performs as well as other paving materials. If found to be economically feasible, a new market for waste glass may have been found.

Glass is one of the oldest packaging containers used and has been a favorite in food packaging. Although it is receiving some stiff competition from plastic, glass is predicted to maintain its proportion of the packaging market in the immediate future. The returnable glass bottle which is good for about 20 trips is being replaced by the no-deposit no-return container.

Estimated Cost of Solid Waste Pollution

An estimated $71 billion has been projected as the possible cost of cleaning up the air, water and land in the United States. Of this total, $54 billion will be needed to clean up waterways, $13 billion to combat dirty air and $4 billion to improve the methods of disposing of solid waste (3).

At the present time, a total of $4.5 billion is being spent each year to handle solid waste. An estimated 80 per cent is spent on collection and 20 per cent on disposal. Despite this outlay on solid waste removal, most land disposal systems (94 per cent) and incinerators (75 per cent) are inadequate. These systems contribute tons of pollutants to the air. An estimated $325 million will have to be allocated within the next five years simply to clean up the air pollution produced by present methods of solid waste disposal (3).

Possible Solutions to the Solid Waste Crisis

Control of the solid waste problem may be greatly enhanced by a number of major undertakings:

* Limit the growth of population to cut down on total waste.

* Develop an improved system of sorting wastes as well as a market for salvaged materials.

* Conduct continuous research to produce plastics that can be recycled or will readily degrade.

* Improve the present methods of solid waste disposal in order to minimize air, water and soil pollution.

* Require and use returnable beverage containers.

* Design automobiles that not only minimize air pollution but also easily assemble into recycling components. Levy heavy penalties for car abandonment.

* Pass legislation that regulates solid waste disposal and enforce it.

* Encourage all-out citizen participation in the fight against pollution.

Present Legislation

The solid waste problem is not something that has happened overnight. It's been going on for years. The problem was given the spotlight when federal and state air pollution laws were passed against the burning dump and the smoking, inefficient incinerators. Water pollution laws are cracking down on dumps and landfills that leech pollutants into ground and surface water.

The Solid Waste Disposal Act of 1965 authorizes the establishment of the Bureau of Solid Waste Management within the Department of Health, Education and Welfare. The bureau is authorized to carry out research, developments and demonstrations of new and improved solid waste technology. This piece of legislation also includes grants for state- and area-wide solid waste management planning, technical assistance to appropriate solid waste agencies and funds for improving the training of engineers and other professional and technical level personnel.

Since most programs for curbing pollution are outside the jurisdiction of federal agencies, state and local governments must clean up pollution. North Dakota Solid Waste Management Regulation (No. 86) was adopted by the State Health Council in May, 1970. Methods of storage, collection and disposal of solid wastes are interpreted (14). North Dakota Air Pollution Control Regulation (No. 82), also adopted by the State Health Council in May, 1970, interprets the state's program of air pollution control. Restrictions on open-air burning of solid wastes as well as on emissions of particulate matter from incinerators and industrial processes are reiterated.

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