There's (Plastic) Gold in Them Thar Landfills

Vanishing landfill space will drive localities to recycle more. The market for used plastic, however, could be stifled by demands that degradable materials be used for packaging

ACROSS THE COUNTRY a backlash is building against one of the staples of American life—plastic. It is spurred by the declining availability of cheap landfill sites and concerns about plastic litter—foam coffee cups and food wrappers that only disappear from beaches and roadsides when picked up. To tackle these problems, local and state governments are rushing to write new laws to control the use and disposal of plastics. Suffolk County on New York's Long Island will ban polyethylene grocery sacks and polystyrene and polyvinyl chloride fast-food packaging beginning in July 1989. Florida and 14 other states also are considering similar measures.

Besides imposing outright bans on the use of some plastics in packing, legislators also are mandating that plastic containers be made of materials that sunlight or bacteria can break down. These responses, however, could ultimately be counterproductive. There are doubts about the real utility for degradable plastics, and some researchers are voicing concern that growing use of these materials could pose problems for emerging plastics recycling operations.

There is, however, little argument about the need to do something about the growing volume of plastic waste. Plastics now account for 7% by weight of all municipal refuse, a figure that analysts say will rise to 10% by 2000. And because plastics can be spun into fibers, molded, or made into films with relative ease, industry and consumers are expected to produce even more plastic waste in the next century. As with paper, steel, glass, and other materials, which account for the bulk of municipal refuse, waste managers and private companies are beginning to devise ways to reclaim plastics from the waste stream.

The challenge of disposing of plastics in municipal wastes has received little public attention until recently. The material has simply been buried or burned. But the rising costs of landfills and of transporting wastes to other states, and concern about the health implications of incinerating some materials, have forced states to seriously consider recycling or the use of alternative materials.

Shaping a strategy to deal with plastics, however, is hard because there is little information about the economics of recycling various plastics. Nor are there standards for deciding what plastics should be degradable. As a result, government leaders, particularly at the local level, are taking action without much information. Citing this scarcity of data, Richard V. Anthony of the National Recycling Coalition, Inc., recently appealed to Congress to set up an information center that local governments can tap for facts.

In the meantime, many state legislatures and members of Congress are championing the virtues of degradable plastics. Congress, for example, has passed a provision crafted by Senator John Glenn (D–OH) that would stimulate the market for biodegradables by forcing the federal government to purchase degradable plastic products as they become available. In particular, he thinks biodegradable plastics, such as garbage bags, that are based on polylactic acid derived from corn should be helped along. On 20 April he introduced S. 2298, a bill that would require the government to give preference to buying these plastics. Besides assuring a market for degradables, Glenn says his aim is to open new markets for farmers.

Senator Sam Nunn (D–GA), chairman of the Senate Armed Services Committee, also is supporting degradables. He amended the Department of Defense (DOD) authorization bill for 1989 to require DOD to study the feasibility of using biodegradable plastics made from corn.

Society of the Plastics Industry

Plastic money. *Empty soft-drink bottles made of polyethylene terephthalate have an economic value because they can be transformed into fiber filling for clothing, textiles, and other products.*

But biodegradables have their critics. Sidney Rankin, a researcher and director of information at the Center for Plastics Recycling Research at Rutgers, the State University of New Jersey, says the materials are unlikely to be a magic bullet that will significantly reduce plastic volumes in municipal waste. And while there may be a perception that milk jugs and other plastic packaging inevitably end up as roadside litter, industry officials say more than 95% lands in the garbage pail. Plastic packaging comprises 25% of the plastics produced in the United States annually and more than half the plastics in municipal waste.

The problem with degradable plastics, Rankin notes, is that most of them cease to degrade once they are buried in a landfill. Photodegradable materials require sunlight, and biodegradable plastics need moisture and oxygen. Furthermore, Rankin says consideration must be given to whether it is desirable to indiscriminantly make plastics degradable. "Things that degrade do not go off into the fourth dimension. They become something else," comments Rankin, noting that there might be some harmful effects on ground water, for example.

Charles L. Swanson, a research chemist at the Department of Agriculture's regional research center at Peoria, Illinois, is studying the use of corn starch as a filler in some plastic films and in polystyrene foams. He agrees Rankin's assessment of the drawbacks of degradables and sees only a limited role for them. They would be useful for products such as sheet plastic used in agriculture and home gardens, for plant pots, disposable diapers, garbage bags, and special items such as the six-pack drink-can collar, which can be hazardous to birds and sea animals, Swanson says.

Some researchers, however, are more bullish. Richard G. Sinclair, a research chemist at the Battelle Memorial Institute, contends that plastics based on degradable polylactic acid could be produced using the excess fermentation capacity of the U.S. ethanol industry. This plastic, he argues, has the potential to displace large amounts of polyethylene, polypropylene, and polyvinyl chloride packaging.

Edward M. Phillips, associate director for

research at the Center for Plastics Recycling, says it is premature to impose broad requirements for degradable plastics. "It could make it far more difficult to recycle in the future," says Phillips, who favors using degradables only in cases where recycling proves to be impractical.

Recyclers argue, in fact, that efforts to encourage recycling and moves to stimulate more use of degradable plastics are working at cross purposes. "Making food packaging degradable will inhibit recycling," says Kyle Wright, sales director of Eaglebrook Plastics, a Chicago firm that buys scrap high-density polyethylene milk and drink jugs. The integrity of the plastic lumber, piping, and other products that Eaglebrook and other waste plastic processors make would be jeopardized if large amounts of degradables are mixed with nondegradable packaging that is being recycled, Wright says.

"The issue here is not to try to get waste to degrade. It should be to get the product out of the landfill. The way to do it is recycling," David Kouchoukos of Perseco Co., a consultant and buyer of packaging products for McDonalds Corp. Even materials such as polystyrene hamburger shells and coffee cups, he says, are headed for the recycling bin. It appears that it will become economic to reprocess these materials, he contends, because of rising feedstock prices and taxes on nonrecyclable packages being imposed by states such as New Jersey.

The plastics recycling business is just beginning to bloom in the United States. The recycling of soft drink bottles made from polyethylene terephthalate (PET), for example, soared from 8 million pounds in 1979 to 130 million pounds in 1986 and could reach 600 million pounds in the United States by the mid-1990s. Wayne Pearson, executive director of the Plastics Recycling Foundation, says similar levels of recycling may be achieved with high-density polyethylene jugs.

Revenue generated from plastic recycling has the potential to equal that produced from the recovery of newspapers—some $300 million, Pearson adds. Scrap high-density polyethylene jugs are going for around 12 cents a pound and 25 cents or more after being cleaned and reduced to flakes. Soft drink bottles and other containers using PET can bring 60 cents a pound.

Markets for recycled plastics have mushroomed because U.S. virgin resin production facilities are operating at capacity and prices for these resins have escalated. Clean, reprocessed material sells at roughly half the cost of virgin material. End uses for PET, for example, include fiber fill for garments, strapping bands, engineering plastics, textiles, and carpeting. Robert A. Bennett, associate dean of the College of Engineering at the University of Toledo, says that the market for recycled plastics "has hardly been penetrated." Only 58 million pounds of recycled polyethylene are being sold yearly, while the U.S. market consumes 7 to 8 billion pounds. He estimates that there is a market today for at least 400 million pounds of recycled polyethylene.

Ways are also being found to use mixed plastics that cannot be easily or economically separated by type and chemical composition. Three plastic extruders capable of handling polyethylene, polystyrene, polypropylene, and limited amounts of polyvinyl chloride are operating in the United States now. They are being used to make landscaping ties, park benches, farm structures, boat docks, and other products. The challenge, says Bennett, is to identify high-volume products that can be fashioned from these mixed materials. The task is made difficult at times because color selection is usually restricted to dark tones and perfectly smooth finishes are not attainable.

While recycling holds tremendous potential, few states are looking at more than half their plastic wastes. New Jersey, for example, has set a goal for its counties of 25%. What is left will continue to be incinerated or go to landfills.

Incineration is facing potential problems of its own, however. There are continuing questions about the safety of burning of plastics in municipal incinerators, especially polyvinyl chloride (PVC). This is a source of hydrogen chloride. It can be transformed in incinerators into dibenzoparadioxins and dibenzofurans, which are thought to be carcinogenic. At this time, the Environmental Protection Agency (EPA) does not regulate the incineration of PVC plastics, but rules governing emissions from municipal plants are due in November 1989.

A recent test conducted by the New York State Energy Research and Development Authority indicates that emissions of dioxins and furans from PVC combustion can be minimized when municipal incinerators are operated above 1500°F. But further research is needed, says David H. Cleverly, an environmental scientist at EPA, to understand the chemical reactions that are occurring and to examine the potential for dioxin emissions to rise if more PVC enters the municipal waste stream.

In the meantime, some localities are taking steps to ban use of PVC packaging materials. And in one instance in Europe, West Germany has banned the use of PVC window frames in public buildings, according to H. Verity Smith, a plastics recycling consultant based in Geneva, Switzerland. This is the result of "public hysteria, promoted by special interests and thriving on ignorance," Smith noted at a European Conference on Recycling held in May in Copenhagen, Denmark, "People do not send their window frames to the public incinerator."

Mid-Atlantic Plastics

Mixed plastics. *The core of a molded "wood" beam is revealed in this cross section (left). The lumber was made from dirty waste plastics with varying chemical compositions, which often cannot be separated and cleaned economically. The material is used for a variety of products, including planters (above) and landscaping ties.*

Even with better information that dispels the myths about the ecological and resource advantages of paper or metal over plastic, the fate of waste plastic may hinge on changing the mindset of the citizenry. The city of San Jose, for example, has a large, successful recycling program with 180,000 homes separating glass, metal, and newspapers from their garbage. But the residents' response to the city's request that they add plastic pop bottles has been pitiful, says Stewart Clarke, director of the operation, which is run by Waste Management, Inc.

Clarke is not surprised. People, he says, are not used to thinking of plastics as having an economic value or being recyclable. But Derek Stephenson, president of Resource Integration Systems, Ltd., of Toronto, Canada, a waste management firm, says its just "a matter of time before communities are forced to recycle more."

More than half the nation's cities face higher disposal costs in the 1990s as they exhaust their landfill space. If trash collection fees are structured to reflect the full life-cycle costs of landfill and incineration facilities, says Stephenson, people will "start being motivated to do the right things."

■ MARK CRAWFORD