Fact Sheet

Recycling the Hard Stuff

"This is a new-to-the-world industry with huge energy savings. Recycling plastics uses only roughly 10 percent of the energy that it takes to make a pound of plastic from virgin materials."

Dr. Mike Biddle
President
MBA Polymers

Of the estimated 22.4 million tons of plastics produced in the United States in 1998, only about 5.4 percent were recovered for recycling. Plastics used in durable goods (such as cars, electronics, and appliances) account for the largest proportion by weight of plastics in U.S. municipal solid waste (MSW). However, the mixed waste streams characteristic of these harder, engineered plastics are difficult to separate and, thus, complex to recycle. New separation technologies could increase recycling rates for plastics significantly.

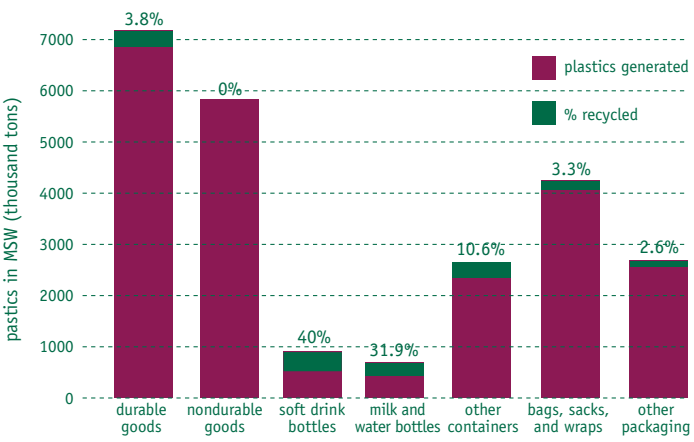
Separating Plastics

The technical difficulties and high cost associated with separating plastics have limited recycling in the past. Post-consumer products often contain as many as 20 different types of plastic materials as well as non-plastic materials such as wood, rubber, glass, and fibers. In addition, the dynamic nature of the plastics business produces a steady stream of new products and pigment types, which can pose a challenge to the recycling infrastructure. Consequently, the cost of producing virgin materials is often less than the cost of collecting and processing post-consumer plastics. Three new separation technologies, developed by MBA Polymers, Argonne National Laboratory, and Recovery Plastics International (RPI), could break down these barriers and increase plastics recycling.

Automated Separation

MBA Polymers, with early financial support from the American Plastics Council, U.S. Department of Energy NICE^3 program, U.S. Environmental Protection Agency, Department of Commerce (NIST ATP), State of California CalTIPP, and Vehicle Recycling Partnership, developed a process in which plastic scraps from computers and other electronics are first ground into small pieces. Magnets and eddy-current separators then extract ferrous and non-ferrous metals. Paper and other lighter materials are removed with jets of air. Finally, a proprietary sorting, cleaning, and testing process involving various technologies, enables the company to separate different types of plastics and compound them into pelletized products comparable to virgin plastics.

Plastics in Products in MSW (1999)



Froth Flotation

Argonne National Laboratory (ANL), with support from the U.S. Department of Energy, developed a process to separate acrylonitrile-butadiene styrene (ABS) and high-impact polystyrene (HIPS)—two common forms of plastics—from recovered automobiles and appliances. The froth flotation process separates two or more equivalent-density plastics by modifying the effective density

of the plastics. The key to this technology is carefully controlling the chemistry of the aqueous solution—the "froth"—so that small gas bubbles attach to the material's surface and enable the plastic to float to the top.

Skin Flotation

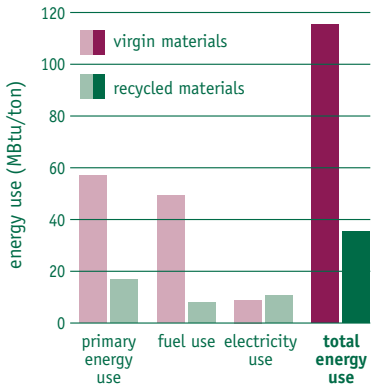
Recovery Plastics International (RPI) has developed an automated process capable of recovering up to 80 percent of the plastics found in automobile shredder residue (ASR). RPI predicts that its new skin flotation technology could divert approximately one-third of the estimated 7 million tons of ASR disposed of each year. The process begins with the separation of light lint materials, followed by the removal of rocks and metals, granulation, washing, and, finally, automated "skin flotation" separation. This final step adds a skin of plasticizer to make the surface of the targeted plastic hydrophobic. Air bubbles then can attach to the plastic, allowing it to float above denser, uncoated pieces.

Benefits

Plastics recovery, in addition to increased diversion from disposal, results in significant energy savings (an estimated 50-75 MBtu/ton of material recycled) compared with the production of virgin materials. Reducing energy use, in turn, leads to reductions in greenhouse gas emissions due to avoided fuel use.

Limiting the plastics that enter landfills can lower the costs associated with waste disposal by reducing tipping fees. In addition, plastics recyclers expect to sell recycled plastic pellets for as much as 70

Projected Energy Savings



percent of the typical price for virgin plastics. Recyclers will profit from selling their product, while purchasers will benefit from the reduced price of recycled plastic.

Challenges

MBA Polymers has been fully commercial for more than a year. Ironically, one of the greatest barriers to operational expansion is the lack of available material. Computer recyclers increasingly find it cheaper to export intact units rather than dismantle the units in the United States. The market demand for recycled plastic resin is clearly growing, but the difficulty is collecting the material and getting it to the recyclers economically. A more developed infrastructure is needed to provide separators with a constant stream of source material.

The other separation technologies are still largely pre-commercial. The next step for these emerging technologies is to conduct pilot studies and establish permanent facilities.

The economic viability of these separation technologies is still largely speculative, but projections made by Argonne National Laboratory and Recovery Plastics International indicate that processing recycled plastics will cost the same or less than manufacturing plastics from virgin materials. Operation costs for processing recycled plastics are estimated in the range of 10-20 cents per pound, which should make recycled plastic resin competitive with costs for existing virgin plastics.

Initial capital costs can be prohibitive, but the payback period is relatively short. RPI estimates that the initial capital cost to install a commercial-size plastics recycling facility (capable of producing 20 million pounds per year) ranges from $2-5 million and has a typical payback period of one to three years. The two other separators estimate two-year paybacks for capital costs.

Additional Information

American Council for an Energy-Efficient Economy (ACEEE)
http://www.aceee.org/

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EPA's Climate and Waste Program increases awareness of climate change and its link to waste management in order to (1) make greenhouse gas emissions a factor in waste management decisions and (2) employ waste management as a mitigation action for reducing greenhouse gas emissions. For additional information on EPA's Climate and Waste Program, see www.epa.gov/mswclimate.

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