

PROFILES IN Garbage: High-Density Polyethylene

By Chaz Miller

High-density polyethylene (HDPE) resin is produced from the chemical compound ethylene.

Bottles are blow-molded while containers are injection-molded. Milk bottles are the most common HDPE package.

Most milk and water bottles use a natural-colored HDPE resin, while detergents, shampoos, motor oils and other products usually have added colorants. Injection-molded HDPE containers also are used for products such as margarine and yogurt. HDPE bottles and containers

use the No. 2 plastic resin code.

Additionally, HDPE resin can be used to make packaging products such as bottle caps, sacks and trash bags.

HDPE bottles and containers began displacing heavier metal, glass and paper packages in the 1970s. Although the amount of HDPE used in packages has almost tripled since 1980, HDPE's solid waste market-share is less than 1 percent.

HDPE bottles and containers are almost half of all HDPE packaging products. This profile only covers HDPE bottles and containers.

Bales of HDPE generally weigh 500 pounds to 800 pounds.

Source Reduction:

- An empty 1 gallon milk jug decreased in weight from 95 grams in the early '70s to less than 60 grams today.
- 1,000 gallons of fruit juice can be packaged in 213 pounds of HDPE containers. This is less weight than that of competing package types, including other plastics.

Recycling Markets:

The packaging industry, which uses post-consumer recycled HDPE for bottles, is the largest HDPE recycling market. Drainage pipe, film, pallets and plastic lumber are other uses. HDPE also is exported, usually in bales with other plastics, to Pacific Rim processors. Markets for clear (translucent) HDPE milk bottles are the highest priced markets for HDPE bottles.

End-Market Specifications:

HDPE bottles fall under the Institute of Scrap Recycling Industries (ISRI), Washington, D.C., Baled Recycled Plastic Standard P-200 (HDPE Mixed), P-201 (HDPE Natural) or P-202 (HDPE Pigmented). These specifications allow for 2% total contamination, no free flowing liquid and less than one month of outdoor storage unless the HDPE is covered with ultraviolet protective materials.

HDPE containers are not covered by any ISRI specifications. These injection-molded containers can be incompatible with blow-molded bottles in reprocessing operations because the two types of packages have different melt flow indexes.

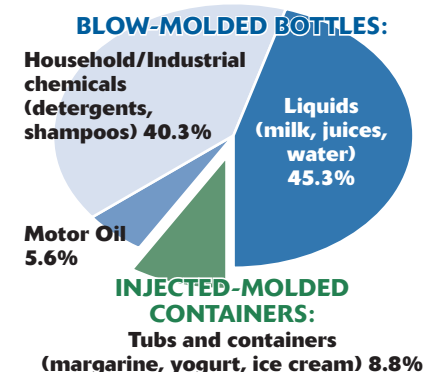
Plastic processors take baled HDPE and separate the bottle components, i.e. caps, labels and their adhesives. They then are washed, dried and ground into HDPE flakes. Some processors produce pellets from the flakes.

Recycling Cost and Value:

- Collection costs range from \$987 per ton to \$1,401 per ton.
- Processing costs range from \$121.58 per ton to \$256.15 per ton.

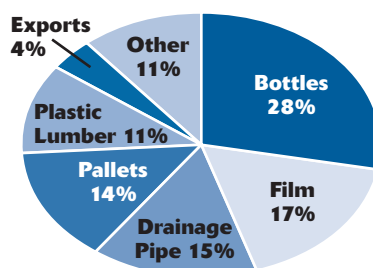
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HDPE Bottles and Containers



HDPE Municipal Solid Waste (MSW) Facts:

HDPE Recycling Markets



Generated:

- 1.92 million tons or 0.87% of total MSW by weight.*
- 14.2 pounds per person in 1998.
- 85% are generated at home, 15% at businesses.

Recycled:

- 370,000 tons for a 19.27% recycling rate.*
- 220,000 tons of liquid bottles for a 31.4% recycling rate.*
- 150,000 tons of other HDPE bottles and containers for a 12.3% recycling rate.*

Recycled Content:

- Some nonfood HDPE containers include limited amounts of recycled HDPE.

Composted:

- HDPE does not compost.

Incinerated or Landfilled:

- 1.55 million tons or 1% of discarded MSW by weight.*
- HDPE is highly combustible with 18,690 Btus in a pound of HDPE compared to 4,500 Btus to 5,000 Btus for a pound of MSW. This high Btu rate causes problems for boilers with low per-pound Btu ratings.
- HDPE is not biodegradable in landfills.

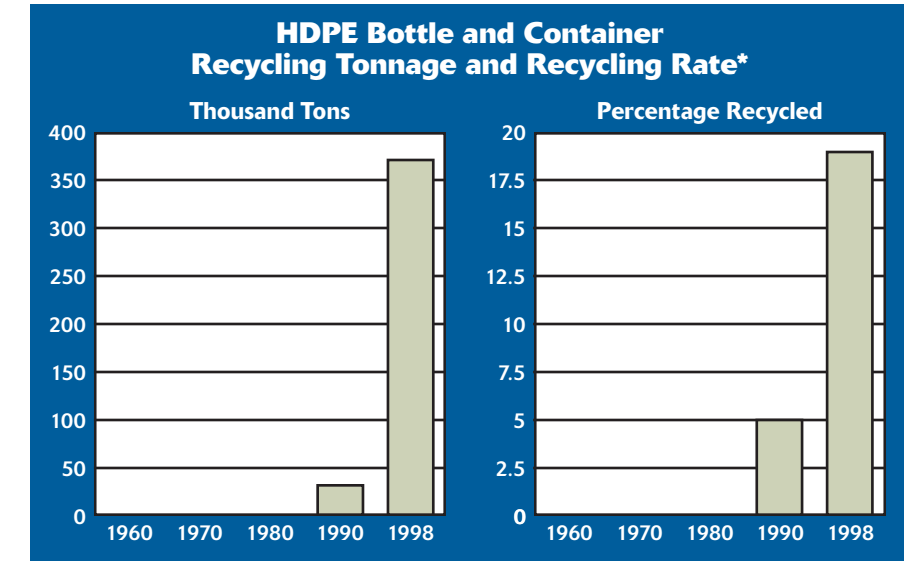
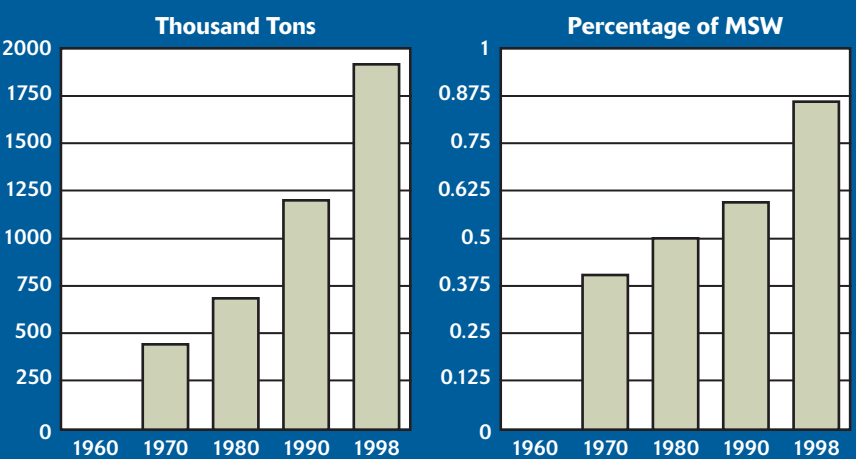
Landfill Volume:

- 6.3 million cubic yards or 1.5% of landfilled MSW.

Density:

- Landfilled milk jugs have a density of 355 pounds per cubic yard.*
- Loose milk jugs have a density of 24 pounds per cubic yard.
- Flattened milk jugs have a density of 65 pounds per cubic yard.
- Loose, colored HDPE bottles have a density of 45 pounds per cubic yard.

HDPE Bottle and Container Tonnage and MSW Percentage*



Sources:

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 *1998 U.S. EPA estimates.