THE GREENER ISSUE

In Praise of Plastic

Why an oil-sucking, landfill-clogging, non-biodegradable, it's-everywhere material is so good for the environment. Really.

By Keith O'Brien | September 28, 2008

IN A WAREHOUSE IN CHARLESTOWN, plastic piles up by the truckload. Milk jugs sit atop soda bottles. Water bottles mingle with Tupperware lids. Not yet recycled but no longer useful, the plastic builds, undulating with peaks and valleys like a mountain range. There are even miniature avalanches as the plastic - maybe 100 tons of it - settles. And even though it is here to be recycled, given a second life as fleece jackets or plastic decking, for some, all this plastic looks like everything that's wrong with 21st century living.

Plastic - symbol of a bankrupt consumer society from its maxed-out credit cards to its obsession with in-bulk acquisition - is about as popular these days as an oil spill. People love to hate plastic for the petroleum used to produce it, for the litter it becomes, for the space it takes up in landfills, and the damage it can do in oceans. At one point this year in the United States alone, the plastics industry faced some 400 pieces of anti-plastics legislation, including one on Beacon Hill and another in Plymouth. Plastic bags - for the plastic-haters, anyway - are especially evil. The goal of most of the proposed laws is taxing the use of plastic bags or banning them outright. And though most have failed or wound up tabled, the anti-plastics people have had their victories, too. Namely, Seattle.

In July, the city of Seattle banned polystyrene takeout food packaging (think Styrofoam coffee cups or soup bowls) and placed a 20-cent tax on plastic bags that is set to go into effect January 1. The City Council's vote, supported by the mayor, shook a plastics industry that was still reeling from a panic in the spring. Parents concerned over the use of a possibly harmful chemical called bisphenol A, found in some clear plastic baby bottles among other things, ditched the bottles in droves, and some stores and manufacturers did the same. Then there was the phthalate ban, enacted by Congress over the summer, singling out yet another worrisome chemical often found in plastic toys.

Overall, it has been a bad year for plastics. But, quietly, the plastics industry, plastics engineers, and plastics lovers - yes, they do exist - are making a case for what may be a misunderstood touchstone of our times. "We see the legislative debates as an opportunity to tell the story of plastics," says Steve Russell, managing director of the plastics division at the American Chemistry Council, the group that represents the plastics industry. "And we believe there's a great story to tell." Plastics, Russell and others argue, aren't just durable, convenient, and inexpensive to manufacture; innovative new plastic packaging is actually more energy-efficient than other alternatives and helps users reduce, not increase, their carbon footprints. Replacing the plastic packaging that is in use today, according to one European study, would use four times as much material from other sources, like paper or aluminum. The key reason why: Plastic is lightweight. Your typical plastic quart milk jug, according to studies, is about 90 percent lighter than its equivalent glass container and about 30 percent lighter than a paper carton. Less packaging means less waste and less energy spent on transport - and packaging is hardly the only application for plastic.

Builders use plastic to wrap new homes, cutting down on heat loss and increasing energy efficiency. Boeing's new 787 Dreamliner, which relies so heavily on carbon fiber reinforced plastic (a type of acrylic) construction that some have dubbed it the "plastic plane," uses 20 percent less fuel than any other airplane of its size. And Detroit automakers, companies that have been using plastic to make dashboards and bumpers for decades, are looking to follow Boeing's lead. In tight times, they want to reduce weight and increase fuel efficiency. The answer: plastics.

"You can usually make a part lighter if you make it out of plastic or composite," says John Wolkonowicz, the senior automotive analyst for Global Insight, a financial analysis and forecasting firm with offices in Lexington and Waltham. "So in the quest to improve fuel economy - without necessarily making the vehicle smaller, because that's not what people want - they're looking to apply more plastic."

There are these benefits, the plastics industry points out, and then there's the obvious one: Plastics are recyclable, able in most cases to be used over and over again. The problem is, Americans, even as global warming becomes an accepted truth, don't take recycling seriously. In 2006, Americans consumed more than 29 million tons of plastic, but recycled just 2 million tons of it, a paltry 7 percent. And as much as supposed Boston liberals driving their hybrid cars and toting their canvas grocery bags might like to blame this failure on the Red States, that argument simply doesn't

fly.

In 2006, the last year with available state Department of Environmental Protection data, just 12 percent of the solid waste that Boston residents hauled to the curbs to be collected was placed in recycling bins - a recycling rate that ranks among the lowest in the state. (That mountain of plastic at the Fairfield County Redemption - or FCR - of Boston warehouse in Charlestown? It's only a fraction of what is actually thrown away.) Across the state, where the average residential recycling rate is 30 percent, about 540,000 tons of plastic was buried in landfills or burned in incinerators in 2006, according to the DEP. And that, it's easy to argue, is the real plastics problem.

PLASTIC HAS BEEN THROUGH TOUGH TIMES BEFORE. In March 1987, a barge ferrying more than 3,000 tons of garbage left Long Island bound for a landfill in North Carolina. But officials there turned the garbage barge away. And with nowhere else to go, the barge wandered for months from port to port. It was ultimately turned away by six states and three foreign countries. No one wanted New York's trash.

So New York finally took it back. That September, the garbage was burned in a Brooklyn incinerator. The barge, called Mobro 4000, became a symbol for American waste, and much of the vitriol, right or wrong, fell on the plastics industry. Within weeks, lawmakers from New York to California were threatening to ban or tax certain kinds of plastics.

Frank Ackerman remembers the scandal - he could relate to the backlash. As a researcher in the early 1990s at the Tellus Institute, an independent environmental research firm in Boston, Ackerman believed, like many people, that plastic packaging had to be worse for the environment than, say, glass. It just seemed like common sense, says Ackerman, who is now a senior economist at Tufts University. Plastic products - from your water bottle to your children's toys - are made with oil and natural gas, finite resources, while glass, for example, is made primarily with sand, "which the world," Ackerman says, "is not going to run out of any time soon."

But in a study Ackerman completed for the US Environmental Protection Agency 1992, examining the environmental impact of different types of packaging, he came to exactly the opposite conclusion. "The biggest difference," he says, "turned out to be how heavy a package was." The lighter, the better. "A smaller, lighter package," Ackerman says, "just uses less raw material." Plastic, not glass, was a winner. "We were astonished," Ackerman says. "Our guess was all wrong."

Newer studies have supported Ackerman's early findings. A 2007 analysis - performed by an independent research firm but paid for by the American Chemistry Council - looked closely at the environmental impact of half-gallon milk jugs, and again plastic fared well. The typical high-density polyethylene, or HDPE, jug was lighter than other alternatives, required less energy to produce, and generated in its life cycle (including shipping) less than half the greenhouse gas emissions of glass and 25 percent less than paper milk cartons. The study confirmed that plastic's major benefit is the fact that it's lightweight.

"There are a number of studies that have showed that even though plastics are made from petroleum, they use less petrol-chemical energy than glass," says Susan Felke, a professor of packaging and the acting director of the School of Packaging at Michigan State University. This fact, she adds, makes plastic the better packaging choice in many cases, even if that's something the general public doesn't appreciate. "It takes some understanding of the complexity of the system," she says. "It's not intuitive."

The American Chemistry Council, representing the $268 billion plastics industry, has used these sorts of arguments to make a case for the industry in recent years, more and more in recent months. It's true, says Kevin Swift, the council's chief economist, that about 169 million barrels of oil were used to make plastic in the United States last year. But that was less than 3 percent of our total oil consumption, he says, "a rather modest amount." And perhaps the most controversial subset of that total, plastic bags and other films, consumes a fraction of the oil, Swift says - 5.3 million barrels a year. And just look, industry officials point out, how much plastic can save elsewhere.

This durable, convenient product keeps food from spoiling, allowing individuals to make fewer, more efficient trips to the grocery store. Applying a thin layer of polyethylene wrap to just one newly constructed house, they say, will save the equivalent of roughly 8,300 gallons of gasoline over the next 30 years - enough to fuel a mid-size sedan for 15 years or a hybrid for 27. Plastic parts in cars save gasoline as well. Constructing just the bumper beam of a Saturn VUE, for example, with plastic rather than metal saves 21/2 pounds and, therefore, according to the American Chemistry Council, 31/2 gallons of gas over the lifetime of one car. Not much, true. But over the lifetime of an entire fleet of 200,000 cars, 700,000 gallons of gas are saved. (The average vehicle today contains about 300 pounds of plastic, so the savings can add up.) And industry officials are even confronting the plastic bag's bad rap.

They argue that plastic bags require 70 percent less energy to manufacture than paper bags and, because they're so

much lighter, less energy to transport. It takes seven trucks to deliver the same number of paper bags that would fit in one truck if the bags were plastic, the American Chemistry Council says. And if these arguments fail to persuade, plastics proponents can always return to the fact that plastic bags and packaging are recyclable. Instead of banning plastic, proponents argue, governments should increase recycling efforts.

In many cases, this would be a relatively simple solution. "Plastic bags are made of polyethylene," says Bob Malloy, a professor and the chairman of the plastics engineering department at UMass-Lowell. "In terms of the recycling of material, there isn't anything in the recycling world more easily recycled than polyethylene." And yet, for the most part, it isn't happening, leaving a total of 27 million tons of plastic each year in search of a landfill or incinerator near you.

TAKE BOSTON, FOR EXAMPLE, AND ITS 12 percent recycling rate. (That means that just 12 percent of the city's garbage went to curbs in blue recycling bins.) Worcester's recycling rate was nearly four times as high. Wellesley's was, too. Salisbury, Rockland, Peabody - in fact, most Massachusetts communities - all topped Boston's rate, according to 2006 state numbers. Boston can do better, says Jim Hunt, the city's chief of environment and energy.

Compared with other major cities, according to the most recent survey from the trade magazine Waste News, it would seem he's right. Using fiscal year 2007 figures, the magazine determined the city's score to be a 15 percent recycling rate, beating out Houston (2.6 percent) and Detroit (10.5 percent) among others, but losing to places like San Francisco (69 percent), Chicago (55.4 percent), and - sheesh - El Paso (16 percent).

One reason why Boston lags behind other communities is that the city doesn't charge residents based on the amount of trash they leave at the curb. The so-called "pay-as-you-throw" model that some communities use gives residents an incentive to pull plastic, paper, and other recyclables out of their trash instead of tossing them. Not surprisingly, that system works. According to state numbers, the average recycling rate in pay-as-you-throw communities is 37 percent, compared with 26 percent elsewhere.

But that alone can't explain Boston's problem. And Massachusetts state officials aren't satisfied with their recycling totals, either. Though the state recycled about 47 percent of its trash, according to the Department of Environmental Protection, only about 10 percent of plastics discarded statewide ended up recycled. A little more than half of what was left ended up incinerated at waste combustion facilities, most of them in-state, says John Fischer, the branch chief for waste and toxics planning at the state Department of Environmental Protection. The rest went to landfills.

Industry insiders see various causes for the resistance to recycling. "It's hard enough to get people to pass a school levy and pay for public schools," says Don Loepp, the managing editor of Plastics News, another trade publication, "much less get people to recycle their trash." Many communities, especially smaller ones, don't offer curbside recycling, making recycling inconvenient. Other communities collect some but not all plastics, making recycling difficult and leaving, say, yogurt cups and cottage cheese tubs to spend eternity in a landfill.

The city of Boston is making an effort to increase its recycling rates. In May 2007, the city tried a pilot program offering larger wheeled bins and easier "single-stream" recycling to 3,000 residents of the city living in Roslindale and Jamaica Plain. Paper, plastics, aluminum, and glass could go mixed into one container - and that container was nearly seven times larger than the old recycling bins they replaced.

The idea worked, says Hunt. Recycling in those neighborhoods rose 53 percent in three months. Recycled tonnage citywide jumped 14 percent between fiscal years 2007 and 2008 as the program expanded, according to city data. Officials believe that trend will continue as single-stream recycling, and those larger containers, reach every corner of the city in the next 18 months.

BUT THERE MAY BE EVEN MORE HOPE for recycling in the simple economic equation of rising oil prices. The price of "virgin" plastic - plastic being made for its first use - has risen dramatically in recent years, driven by many of the same market forces pushing up gasoline prices. For example, polyethylene terephthalate, or PET (used for most soda and water bottles), typically sold for less than 60 cents per pound in the 1990s. It is now selling for nearly $1 a pound. The cost increase makes recycled plastics more desirable to manufacturers, and with the demand for recycled plastics rising, new markets are emerging. Manufacturers that once may not have been interested in polypropylene yogurt containers - because historically there wasn't enough polypropylene being recycled to rely on it for the manufacture of new products - are now buying it back, says Patty Moore of Moore Recycling Associates Inc., a national recycling consulting group based in California. And other previously discarded plastics suddenly have value as well. "Kiddie pools, resin chairs, pails and buckets," Moore says. "There's so much plastic out there right now, and there's no reason why we shouldn't be capturing it. Because there are markets for it and there are people who want it."

At the FCR of Boston warehouse in Charlestown, where all of the city's curbside recycling goes, Bob Cappadona's

workers have begun adapting to this market, recycling some plastics - like patio chairs - that would in the past have gone to the dump. Such items aren't officially on the list of what's OK to leave on the curb, says Cappadona, the recycling market manager. But lately, when residents leave them there, haulers are taking them anyway, knowing that Cappadona's company can sell them. Retail businesses like grocery and big-box stores are also recycling like never before, recapturing plastic films, like bags and wrap, that once went out with the trash and selling them back to plastics manufacturers. In 2007, Shaw's recycled 2.4 million pounds of plastic, up 39 percent from the year before.

Less plastic in incinerators and landfills is a good thing, everyone can agree. But the fact remains, it's still made from oil and natural gas. It's still out there, clogging up street gutters, floating in waterways, and sitting in landfills. But there's another way to look at the problem that might catch on. "Products are more durable, more efficient and more convenient - that's what I'm seeing," says Malloy, the professor at UMass- Lowell. "Plastics generally improve the quality of life. I don't want to see plastic bags and bottles at the beach, either. But to me, that's not a plastics problem. Those plastic bottles and bags are completely recyclable. It's people."

LIFE CYCLE OF A PLASTIC BOTTLE
US consumers used more than 9.3 billion pounds of plastic bottles in 2006. That's roughly enough plastic to fill a line of semitrailers stretching from Boston to Los Angeles. Where did all this plastic come from and where did it go?

In the US, 76% of plastic bottles - about 7.1 billion pounds of them - ended up burned in incinerators or buried in landfills in 2006.

Natural gas and petroleum are converted into polyethylene terephthalate, a chemical compound commonly known as PET.

PET pellets are melted and blown into bottle molds.

A beverage company fills and caps the bottles . . .

. . . then distributes them to gas stations, vending machines, and grocery and big-box stores.

A consumer buys the water, drinks it, and has a choice:

Tossing the bottle in the trash . . .

. . . or tossing the bottle in a recycling bin.

At recycling centers, the bottles are sorted, washed, and stacked, then finally crushed, baled, and sold (for 38 to 66 cents per pound).

At a mill, the plastic is ground into shreds and melted. Used PET is typically recycled into other products, often polyester fleece jackets, carpets, or plastic decking.

SOURCES: The American Chemistry Council and Moore Recycling Associates

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Due to an editing error, Frank Ackerman's title was misstated in Sunday's Globe Magazine story, "In Praise of Plastic." Ackerman is a senior economist at Tufts University.

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