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WHAT'S IN STORE FOR PLASTIC BAGS?

Conservation? Fees? Deposits? Recycling? Bans? While no single solution can clear up the plastic bag quagmire, a host of possibilities are making a play to be the magic bullet.

by Nina Bellucci Butler

Despite the polyethylene (PE) bag's comparative energy efficiency and growing role as recycled feedstock for domestic manufacturers, consumer habits have left bags hanging. As witnessed by San Francisco's initiative requiring supermarkets and pharmacies to use only compostable shopping bags, there is growing interest in bag bans. Plastic bags are undeniably convenient and cheap, which is why they are so ubiquitous, but the hidden costs are far from cheap.

Plastic bags exist in a complex landscape where consumer habits, a recycling infrastructure, politics, energy concerns and emerging bio-based plastic production all converge. Through careful analysis, policy choices may help us avoid unintended consequences, such as increased greenhouse gas emissions and waste inadvertently generated by the destruction of a burgeoning bag recycling infrastructure.

Bio-based plastic or paper bags: An easy fix?

Plastic bags (and other applications) made from corn or other renewable feedstock offer exciting potential to facilitate food scrap

special focus
RECOVERED PLASTICS

recovery, even though, according to European Bioplastics (Berlin) and the CMAI (Houston), bio-based plastic production is less than one percent of traditional plastics. Conversely, bio-based plastic bags also could disrupt the much larger recycling infrastructure for clean, high-density polyethylene (HDPE No. 2) and low-density polyethylene (LDPE No. 4) film, because bio-resins are a contaminant to PE in the recycling stream.

Unfortunately, only a handful of communities (e.g., San Francisco and Seattle) offer commercial food scrap composting, whichmeans that bio-based plastics likely will end up in landfills or as litter. As most bio-based plastic bags degrade rapidly only in environments with specific conditions (i.e., hot composts), rapid degradation is unlikely to occur outside of those conditions. One of the biggest public misconceptions is that waste in a landfill is meant to degrade. And should it degrade, few understand that this degradation, if anaerobic, leads to release of methane gas, a greenhouse gas 23 times as potent as carbon dioxide in trapping heat.

Of course fewer bags should be used, whether paper, bio-based plastic or tradition-

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Recycled PE film products requiring high-quality feedstock

- Garbage bags
- Non-food retail bags
- Grocery bags
- Other markets (e.g., blow-molded protective packaging for electronics)

al plastic, which is what San Francisco initially proposed with the introduction of a bag fee. However, California's new legislation requiring retailers to offer bag recycling prohibits local governments from passing a fee or tax. The city's current law, eliminating recyclable PE bags altogether, removes an opportunity to collect a huge portion of the plastic waste stream, because most grocers already accept clean, dry No. 2 and No. 4 bags and film (such as bread and newspaper bags, the wrap around toilet paper and dry cleaning bags). If forced to eliminate traditional plastic bags, then grocers will no longer provide bins for customers to recycle plastic bags as the markets for plastic film will not want bio-based plastic contamination.

Some people are quick to dismiss this reality while estimating the rather meager recycling rate for bags, but the fact is bag recovery is growing rapidly as more people demand recycling options for plastic bags. Legislation in California and Rhode Island requires grocers to collect plastic bags.

If forced to use compostable bags, most stores will likely switch to paper due to the very limited supply of bio-based plastic. Grocers currently offer plastic bags because they are inexpensive and convenient, but also because they offer significant water and energy savings over the production and transportation of paper bags. Production of plastic bags uses only four percent of the amount of water needed to produce paper bags. Moreover, paper bags generate roughly four times as much greenhouse gas emissions as plastic bags. In fact, if comparing plastic to paper bags, paper bags require seven more trucks on the road to deliver the equivalent of one truckload of plastic bags. Granted, most consumers fit more items in paper bags versus plastic, sometimes leaving the store with only one item in a plastic bag.

Thus, mandated use of biodegradable bags, in applications where a recycling infrastructure exists, will lead to hefty unintended consequences.

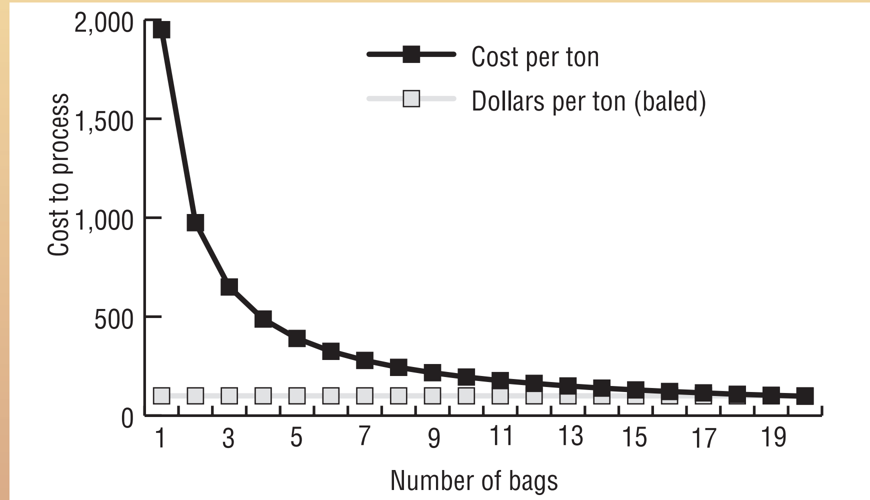
How much film is out there?

An informal poll taken by Moore Recycling Associates, Inc. (Sonoma, California) found that, despite the use of cloth bags and reuse of plastic bags, most employees still manage to accumulate enough material – bags and other clean mixed film – to require regular offerings to the local grocery store recycling bins. Perhaps this is because grocery bags account for a rather small percentage of the category of plastic called "film," or thin flexible sheets of plastic that can be recycled along with grocery bags. According to the U.S. Environmental Protection Agency (Washington), plastic bags represent less than three percent of plastics in U.S. municipal solid waste, whereas film is responsible for more than 13 percent of the plastic waste. In some regions, such as California, film makes up almost half the plastic waste stream – likely due to California's higher recovery rate of plastic containers.

Pallet wrap or stretch wrap, often found in warehouses or shipping centers, accounts for a large portion of the film segment. An exact amount is hard to determine considering approximately 40,000 shipping containers enter the U.S. country every day containing packaged goods. Use of film has increased with the growth in global trade. Companies use film because it protects products without adding the excessive weight of alternative packaging (e.g., cardboard), thus reducing the amount of fuel used in transportation. Ironically, film is produced from fossil resources, but also lessens demand for fossil fuels as it enables light-weighting. Transportation consumes far more fossil resources than is used to make plastics.

Most film produced in the U.S. is made out of polyethylene, a polymer derived mainly from natural gas. An increasing number of bags are imported from countries less rich in natural gas, thus imported bags may be produced from petroleum rather than natural gas, depending on the country of manufacture.

Figure 1 Processing costs versus scrap value



Source: Moore Recycling Associates, 2007.

Despite this potential difference in the primary feedstock for PE, most of the film thrown away can be recycled. Nearly 700 million pounds of post-consumer film was recycled in 2005, and far more than that in 2006 and 2007. Advanced Environmental Recycling Technologies (Springdale, Arkansas) and Trex Co. (Winchester, Virginia) alone estimate they will need 1.2 to 1.5 billion pounds of film feedstock in 2007.

End-use markets

The end-use markets for recycled polyethylene film fall into two broad categories: Those that require clean film and those that can tolerate wider specifications.

Some end-uses of recycled PE film need a high-quality feedstock. The markets require a resin with very low contamination and very consistent melt flow in order to maintain integrity of the thin-walled sections during the film blowing process. Thus, in order to use post-consumer PE material, manufacturers must utilize traditional, but costly, granulate-wash-rinse-dry-melt filter-extrude-pelletize-package operations. Producing a thin, strong bag with recycled-content resin is very challenging, as recycled content often leads to a thicker (i.e., heavier) bag.

Other products, however, have wider specifications and are more tolerant of minor contaminants. Most post-consumer film and bag scrap goes to the composite lumber market, which has historically paid suppliers the highest price for bales. Because composite lumber manufacturers are generally able to bypass washing and drying, the recovery process is economically and environmentally cost-efficient.

Demand for relatively clean scrap film is strong and expected to grow steadily. Considering the composite decking industry is

Recycled PE film uses with wider specifications

- Railroad ties
- Parking lot curbs
- Signs
- Structural supports
- Playground items
- Landscaping
- Plastic pallets
- Building construction
- Profile extrusion of composites for window and door frames
- Molding of composites for shakes, shingles and doors
- Deck lumber, docks, posts and marine pilings, tables and benches

Current value of post-consumer film grades

The following descriptions indicate the variation in film quality as it is sold in the marketplace. The grades are in order of highest value to lowest.

Moore Recycling Associates tracks post-consumer scrap plastic prices through multiple buyers. The descriptions include current prices paid for delivered material, though prices do not include shipping.

Post-consumer film grades (current value in truckload quantities)

Commercial film: Clear, clean PE film, including stretch wrap and poly bags ($0.25 per pound)

Mixed film: Mixed color, clean PE film, including grocery bags ($0.215 per pound)

Clean ag film: Agricultural PE film, dry from uses that do not touch the ground – up to 10-percent contamination ($0.07 per pound)

Curbside film: Mixed PE film generated at a MRF ($0.05 per pound)

Dirty ag film: Agricultural PE film from the ground – up to 30-percent contamination ($0.025 per pound)

growing at a rate of 20-percent annually, composite material represents an attractive alternative to wood in the decking industry. However, only the two largest composite decking companies currently use post-consumer plastic and scrap wood as alternatives to virgin timber and plastic.

Trex Co., North America's largest manufacturer of composite decking, generated 2006 sales of over $320 million. In 2006, Trex used more than 350 million pounds of recycled PE plastic, and the company expects to consume as much as one billion pounds of recycled polyethylene annually by 2010. AERT, the second largest domestic user of recycled PE film, entered into a joint development agreement with the Dow Chemical Co. (Midland, Michigan) in 1991 to develop PE film recycling technology.

AERT and Trex both offer limited lifetime warranties, so the issue of recovering scrap lumber is a distant issue. Theoretically, the material can be recycled back into new lumber. However, as with all recycling ventures, the catch is usually in the logistics of efficiently getting the material to market.

Beyond the big players, including the export market, a growing number of companies are sourcing recovered film as a flexible alternative to virgin resin in a variety of applications. Companies such as Agri-Plas (Brooks, Oregon), Nextlife (Delray Beach, Florida) and, most recently, Eno Plastics (Camarillo, California) process film for use by other manufacturers.

Scrap prices and the marketplace

The scrap film market has offered relatively strong prices on a consistent basis for clean material, and even the middle grade material, since November 2004. Mixed film generated through grocery recovery programs has been far more valuable per ton than corrugated containers for more than two years.

Export buyers accept a broad range of film grades; however, some domestic buyers also handle limited quantities of agricultural or curbside scrap film, particularly when the price for premium grade material is high. While domestic buyers incur higher shipping costs compared to ocean freight costs for exporters, the export buyers must pay inland freight, which tends to even things out. However, processing contaminated material in China does cost significantly less than in the U.S.

The key to a healthy recycling industry is local supply and local demand. Most domestic film buyers complain about limited supply, which is unfortunate considering the potential value of material that ends up in landfills. Simply put, the film collection infrastructure needs to expand.

Collection methods: Curbside and drop-off

While most plastic film is recyclable, curbside collection of film is usually not effective. The idea of just throwing the recyclable material in the curbside bin is appealing, but yields a lower grade commodity, while creating significant processing costs and problems.

Today's single-stream material recovery facilities (MRFs) are designed to separate containers from fiber, not loose film. Unless a facility has the capacity to dedicate staff to presort areas, film usually clogs the sorting equipment, rendering the whole operation less efficient. Conversely, if consumers collect multiple bags into a single bag, the processing costs at a MRF would decrease significantly and be comparable with the scrap value of curbside material. Figure 1 highlights this cost-value proposition based on the following assumptions: Seventy bags in a pound, one bag is pulled about every second with two sorters picking bags. However, the figure does not include the cost of baling or shipping.

Based on these cost assumptions, retail store collection offers an attractive alternative. But, as noted earlier, retail participation is dependent on its ability to provide plastic bags. Furthermore, in-store collection of film and bags is a convenient recovery method for both the public and the retailer, since retailers generate a stream of recyclable film, primarily stretch wrap. Also, consumers appreciate the ability to take back bags during shopping trips.

Retail bag collection also provides the public an opportunity to recycle much more plastics, since curbside film collection has limitations. All clean, dry No. 2 and No. 4 film is compatible for recycling with grocery bags through retail programs.

Stores usually combine the material collected from customers with pallet wrap and other film found in back-end operations. Consolidation leads to efficiency, which is why many stores are finding ways to recover film during cardboard collection. Businesses that generate cardboard often generate film, and co-collection offers an efficient way to collect two commodities without the challenge of contamination from liquid and food that might occur if film were co-collected with bottles and cans. The key is persuading haulers to pick up bagged or baled film with the bales of cardboard.

With more businesses and municipalities collecting film through drop-off programs, the next goal is to encourage the public to take advantage of recycling options. Promoting bag recycling and conservation in stores works, because stores are where people both obtain bags and have the option to recycle them. A successful in-store campaign often includes:

- Reduction in wasteful use of all types of bags (e.g., encourage reuse, and avoid double bagging or bagging items with handles)
- Expansion of film recovery programs
- Increased public participation in the recovery of all-recyclable film material through

retail drop-off programs.

Through early involvement in a recycling campaign rather than fighting punitive action by local and state governments, retailers can distinguish themselves as environmental stewards.

Where do we go from here?

Consumers and retailers will make choices about bag use based on total cost, both environmental and economic, but only if they are assessed the real cost of goods. Many potential alternatives are on the table, including bans, fees, mandatory retail collection, conservation and recycling education, and doing nothing.

The relative importance assigned to environmental impacts varies, but reducing greenhouse gas emissions is certainly an overarching objective. Such reductions will require a radical shift in conservation efforts, requiring a focus on reducing the amount of material consumed. Will a plastic bag ban reduce how much material is consumed? Will it facilitate resource recovery? Unlikely, if consumers have access to only paper bags. More than likely, litter will be reduced as solid waste, energy and water use increases. Plastics are a growing portion of the waste stream, but pale in comparison to the paper massing in landfills. While bio-based plastics offer potential, they, too, will likely result in more waste and no reduction in litter unless municipal food scrap collection and litter prevention grows dramatically.

Collection infrastructures take time to develop. Now that film recovery is showing dramatic promise, bag bans may put a halt to the progress. As with most complex issues, the best solution is often the result of collaboration and an exploration of all of the necessary trade-offs. Retail companies that have voluntarily taken the initiative to recycle and conserve should be acknowledged. Some retailers, such as IKEA (Leiden, the Netherlands), are voluntarily charging customers for bags; other stores provide a monetary reward to customers who reuse bags.

Consumers are actively looking for a place to recycle plastic bags. The end-use infrastructure exists and users are paying for additional material. Facilitating recycling sometimes feels like it is enabling increased use of resources. Recycling should not serve as a replacement for source reduction or reuse, but rather as a transition to a more sustainable way of life. **RR**

For more information about recyclable film and bags, go to www.plasticbagrecycling.org. The site includes:

- A directory of buyers
- A calculator tool to analyze the economics of recovery
- A step-by-step guide on how to set up a program
- Information for recycling coordinators interested in facilitating recovery in their area.
