

**Board of Directors Meeting Highlights
Held on September 21, 2017 at 9:00 AM
at the MRF Board Room**



New Minister Responds to Request Without Delay

Much to our surprise, the MOECC is operating business as usual despite Minister Murray's resignation and an upcoming election. In response to the July 7th co-signed letter from MWA, AMO, RPWCO, City of Toronto and Stewardship Ontario, the Minister has directed the Resource Productivity and Recovery Authority and Stewardship Ontario to develop a proposal to transition the Blue Box Program Plan to full EPR ahead of the previously scheduled date of 2023.

On July 7, 2017, the Association of Municipalities of Ontario, City of Toronto, Regional Public Works Commissioners of Ontario, Municipal Waste Association and Stewardship Ontario (SO) submitted a joint letter to advise the ministry of an accord these organizations had collectively reached on the future of the Blue Box Program and to request that the ministry issue a requirement for program changes to the Blue Box Program Plan (BBPP) as the first step in its evolution towards a circular economy.

In response to the joint request, Hon. Chris Ballard, Minister of the Environment and Climate Change, issued a requirement letter on August 14, 2017 to direct the Resource Productivity and Recovery Authority (the Authority) and SO to develop a proposal for an amended BBPP.

As noted in the Minister's requirement letter, the proposal for an amended plan is expected to outline the first phase of the transition for the Blue Box Program under the Waste Diversion Transition Act, 2016 (WDTA), and set the stage for the second phase of transition that will result in individual producer responsibility under the Resource Recovery and Circular Economy Act, 2016.

It is expected that the Authority and SO will work collaboratively with municipalities, stewards and affected stakeholders when developing the proposal for an amended plan per section 13 under the WDTA. If approved by the Authority, the proposal will be submitted to the Minister for approval by February 15, 2018.

Authority Consulting on Fee Setting Policy

The Resource Productivity and Recovery Authority (RPRA) is hosting webinar consultations on October 4 and 5 to provide an overview of RPRA's approach to developing its General Fee Setting Policy and to seek your advice and feedback.

To support these consultations RPRA released a Fee Backgrounder that includes context for the development of the policy and a set of proposed objectives and principles. The outcome of the consultations will assist the Authority in developing its General Fee Setting Policy, which in turn will inform how the Authority structures and sets its specific fee amounts.

The consultation webinars will be recorded and posted on RPRA's website.

RPRA Sets 2018 Blue Box Steward Funding Obligation at \$124.8 Million

The Resource Productivity & Recovery Authority (the Authority) has set the 2018 Blue Box Steward Funding Obligation at \$124.8 million, a 1 % increase from the \$123.6 million obligation set for 2017.

The Blue Box Steward Funding Obligation is the total amount that stewards must pay to municipalities for the Blue Box Program.

In addition to information on costs and amount of materials collected through the Blue Box program obtained through the annual municipal Datacall survey conducted and verified by the Authority, the Authority considered a number of factors in determining the 2018 funding obligation, including:

- Cost Containment to reflect best practices in operating municipal waste diversion programs
- Evolving Tonne to reflect the lightweighting trend in packaging
- InKind Linage to reflect the share of promotion and education through newspapers using InKind lineage attributable to the Blue Box program
- Non-Obligated Materials to reflect a portion of the costs to collect materials through the Blue Box program that are not mandated
- Three-Year Rolling Average Revenue to reflect volatile commodity prices
- Prior Year Adjustments to reflect any errors identified by the Authority in verifying and auditing Datacall information

In setting the 2018 steward funding obligation, the Authority used the 2017 methodology with updated inputs on the following basis:

2018 Steward Obligation (2016 Data Year)

Reported Gross Cost	\$346,999,803
Plus 54% of InKind Linage	\$2,270,723
Less Non-Obligated	(\$95,815)
Less Cost Containment	(\$15,837,860)
Total RPRA Gross Cost	\$333,336,851
Less 3 Year Average Revenue	(\$88,479,060)
Plus 100% of Prior Year Adjustments	\$415,659
Total RPRA Net Costs	\$245,273,450
50% of Net Costs	\$122,636,725
Plus Steward Cost Containment	\$2,207,461
2018 Steward Obligation	\$124,844,186

Kenya brings in world's toughest plastic bag ban: four years jail or \$40,000 fine

Producing, selling and using plastic bags becomes illegal as officials say they want to target manufacturers and sellers first

Kenyans producing, selling or even using plastic bags will risk imprisonment of up to four years or fines of \$40,000 (£31,000) from Monday, as the world's toughest law aimed at reducing plastic pollution came into effect.

The east African nation joins more than 40 other countries that have banned, partly banned or taxed single use plastic bags, including China, France, Rwanda, and Italy.

Many bags drift into the ocean, strangling turtles, suffocating seabirds and filling the stomachs of dolphins and whales with waste until they die of starvation.



‘There is so much out there’: Kenya’s plastic bag battle – in pictures

Plastic bags, which El-Habr says take between 500 to 1,000 years to break down, also enter the human food chain through fish and other animals. In Nairobi’s slaughterhouses, some cows destined for human consumption had 20 bags removed from their stomachs.

Kenya’s law allows police to go after anyone even carrying a plastic bag. But Judy Wakhungu, Kenya’s environment minister, said enforcement would initially be directed at manufacturers and suppliers.

It took Kenya three attempts over 10 years to finally pass the ban, and not everyone is a fan.

Samuel Matonda, spokesman for the Kenya Association of Manufacturers, said it would cost 60,000 jobs and force 176 manufacturers to close. Kenya is a major exporter of plastic bags to the region.

Big Kenyan supermarket chains like France’s Carrefour and Nakumatt have already started offering customers cloth bags as alternatives.

Roundup of the latest developments on China's ban

Chinese importers enter their fourth month without renewed import quotas, and ISRI says meeting a 0.3 percent contamination limit is impossible.

Paper crackdown: Chinese importers have not received renewed permits allowing additional imports for more than three months. According to paper market publication RISI, importers are not confident they'll receive new permits any time soon. Sources told the publication Chinese authorities are continuing to step up inspections at the border, particularly on recovered paper shipments. Mills also told RISI they predict import allowances will be reduced next year and that the process for approval will become more rigorous.

Survival advice: Although the policy change will bring challenges for recycling companies and municipal programs, The Recycling Partnership says the impact can be reduced if all players follow some key steps. Essentially, the organization advises parties to take the opportunity to ensure their stream is as clean as it can be. The Recycling Partnership suggests municipal programs keep in touch with their MRFs, ensuring both parties understand which materials are contaminating the stream. With that information, municipal programs can work with the public to cut down on contaminants, thus creating the highest-value recyclables.

Feedback on specifics: The Institute of Scrap Recycling Industries (ISRI) has responded to new details about the materials that will be allowed into China. In an Aug. 25 letter to Chinese officials, ISRI described language in new regulations that would limit allowable contaminant levels to 0.3 percent or less. That restriction, ISRI said, "will effectively result in a ban on the importation of all these commodities. It is simply not possible to achieve such a control level, nor is it possible to even measure it with such accuracy." For reference, under ISRI's published scrap specifications, paper shipments are generally allowed with between 1 percent and 5 percent contamination.

Precise wording: ISRI also addressed a concern that's come up several times during China's increased focus on import regulations. In separate remarks to the World Trade Organization, ISRI called on Chinese officials to differentiate scrap materials from waste. Without that delineation, valuable materials are lumped in with garbage in import discussions, according to ISRI.



Commodity Market Trends*

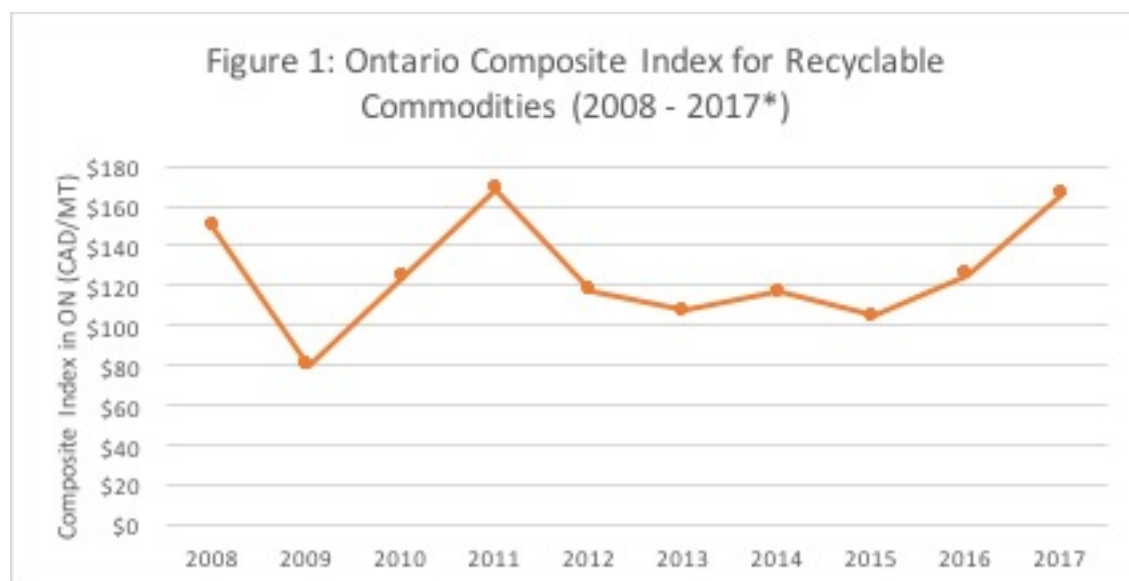
China is the largest importer of recovered materials in the world, accounting for approximately 27% of global scrap imports. In July, China informed the World Trade Organization (WTO) that it will be imposing a ban on importing 24 types of scrap as of September 2017. In its response to the ban, the Institute of Scrap Recycling Industries (ISRI) suggests that the current language used by China does not differentiate between waste (garbage with no value) and scrap (defined by ISRI as valuable commodities). ISRI interprets China's language as potentially targeting all post-consumer commodities, even relatively clean commodities such as (11) Old Corrugated Cardboard (OCC).

While this may seem like a drastic measure, often dirty or even hazardous waste has been found in mixed recovered materials imported into the country. Additionally, the yields of certain commodities have diminished as the types of packaging supplied by producers continue to change. Producers continue to lightweight their packaging, and move to flexible and laminated packages, which produces new challenges not only to MRFs sorting them but to end markets. While this ban is meant to reduce the importation of contaminated and hazardous materials, the repercussions could be significant.

This is not the first time China has implemented a policy to curb the inflow of contaminated scrap. China's first crackdown was in 2013 when it implemented its Green Fence Policy, which similarly targeted the importation of low grade paper and plastics. Also, beginning in 2017 China implemented the "National Sword 2017" policy to crack down on imports of scrap, specifically targeting low grade plastics.

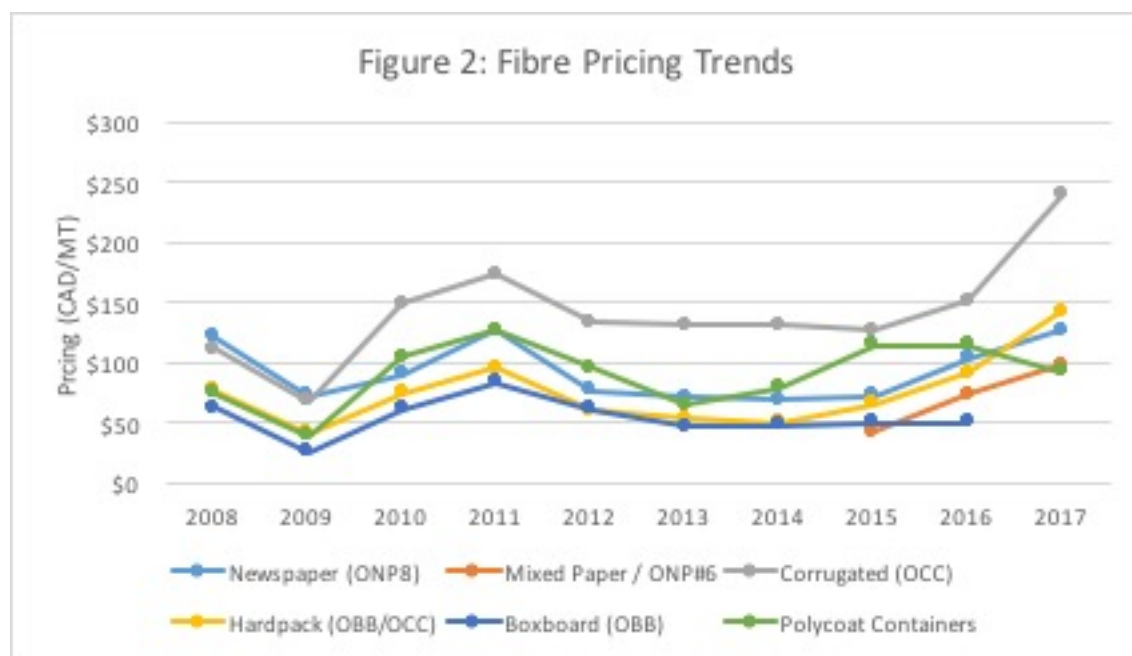
So how does this affect the Ontario recycling market? If you combine the Chinese activity with the closure of several large North American recycling facilities including Resolute Forest Products' paper mill in Thorold, ON, Entropex entering receivership (now reopened as ReVital Polymers) and the recent closure of a QRS Plastic Recycling Facility in Baltimore, the market threats become quite real for Ontario.

Potential Ontario market impacts are best understood in light of year over year commodity pricing trends which have been volatile for all commodities. As Figure 1 illustrates, the composite index over the past decade has seen large annual swings. (Note: The 2017 composite index pricing is based on the first 7 months only).



Source: CIF Price Sheet as compiled by Reclay StewardEdge Inc.

The graph above shows municipalities were hard hit by the global financial crisis in 2009. It took two years to reach the same commodity pricing levels as before the crash and prices fell off 25% in 2012. Currently, municipalities are experiencing a significant price spike largely driven by fibre products (see Figure 2). OCC has reached a high, unmatched since the late 1990s.



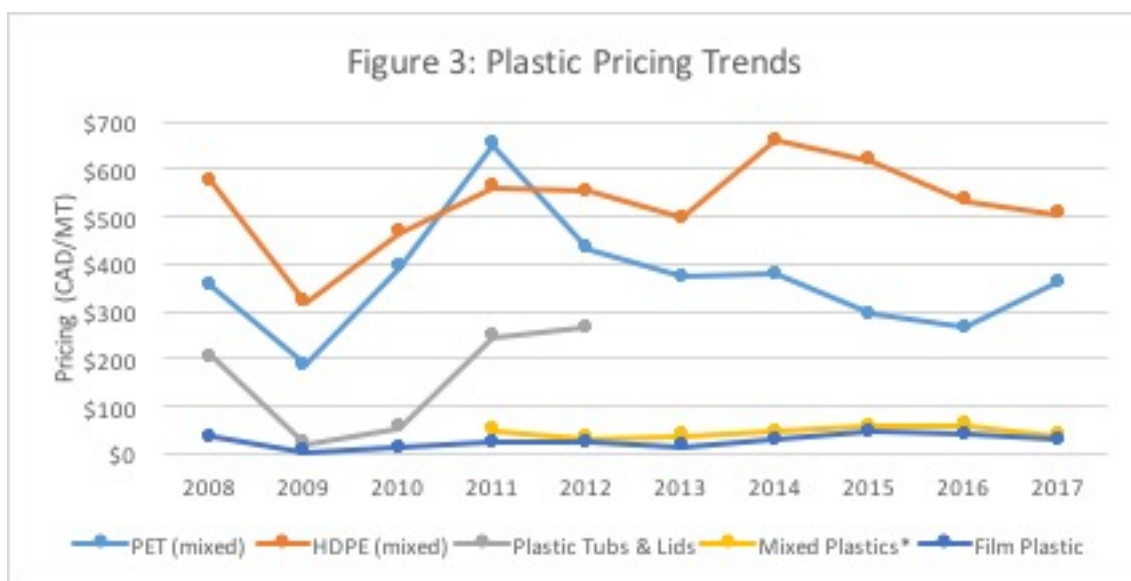
Note: 2017 OBB insufficient data

Even as fibre pricing experiences a high, the same can't be said for plastics and metals. For most plastics and metals, pricing has seen flat to little growth, with some materials trending downwards. In particular, PET and Mixed Plastics have struggled in recent years due to low oil and natural gas prices, which have driven down the price of virgin materials in comparison to recyclables.

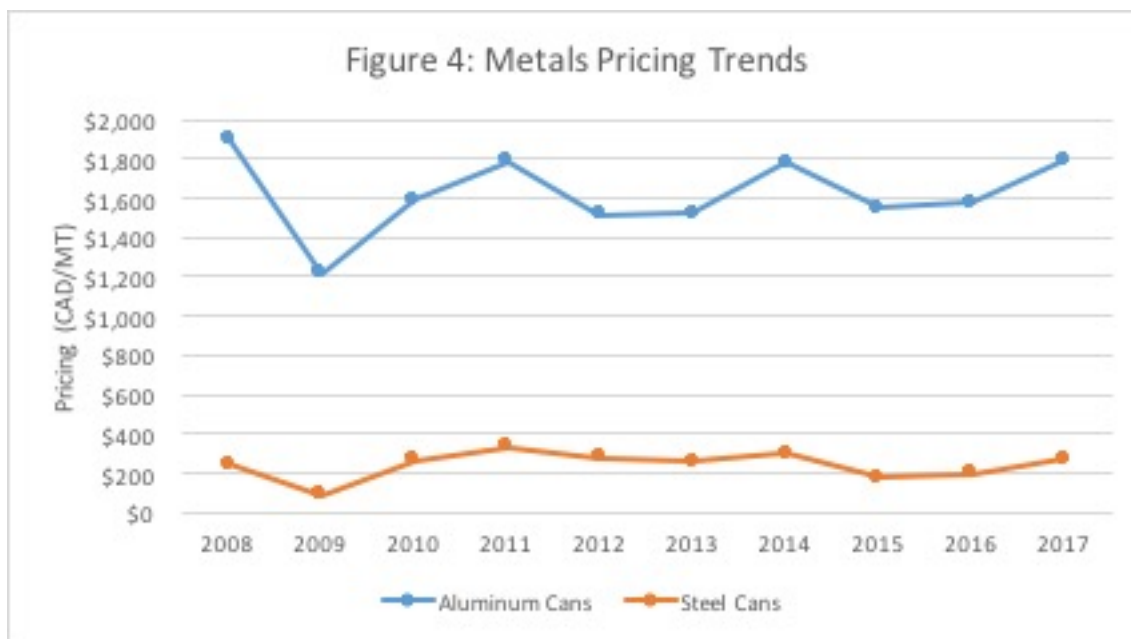
This concern is highlighted by the announcement earlier in 2017; a Canadian and Kuwaiti firm formed the Canada Kuwait Petrochemical Corp. (CKPC), which intends to produce 1.2 billion-lb/year of propylene monomer and polypropylene resin in Alberta. This new large scale project, along with other similar plants under development globally, can be anticipated to flood the market with low price virgin materials, further threatening Ontario's recycling industry.

If China does follow through with its proposed ban, global markets may see a potential glut of supply and plummeting prices for these commodities. Based on the current language of China's proposed ban, ISRI estimates it would affect 2.9 million tons or \$532 million (USD) of US exports for mixed paper and plastics. During the 2013 Green Fence implementation, other markets in Vietnam, Malaysia and India had begun to prop up the industry by undertaking additional sorting before shipping into China. These efforts overcame the 2013 regulatory barriers but at a significant loss in revenue and market capacity. Similar efforts may be necessary to address the new regulations.

Bottom Line There are some real threats pending, and significant levels of uncertainty ahead for the recycling industry, not only in Ontario, but globally. These threats could result in a significant decline of commodity pricing due to additional closures of reclaimers, specifically plastic reclaimers, and the potential for municipalities to cease collection of certain materials. In addition, the types of packaging introduced by producers are increasingly complex, which introduces new sorting challenges.



Note: In 2013 municipalities began reporting prices for 3-7 plastics instead of Plastic Tubs.



However, as Ontario moves towards full producer responsibility there are opportunities to address these issues. Companies like Tetra Pak, Kellogg, Unilever, Walmart and many others continue to push toward aggressive sustainable and zero waste goals and development of domestic market capacity. Perhaps the pending ban(s) will spark opportunities for further domestic market development in Ontario.

The recycling market has fluctuated for decades and this is no exception, but near term market forces are combining to put greater than usual pressure on commodity pricing in 2018 and beyond. For MRFs and municipalities, the key to weathering this storm is production of high quality bales. As in the past, MRFs producing reliable quality will typically find a home for their materials. Locking in to longer term agreements with end markets is also recommended to ensure access to limited domestic reprocessing capacity.

MRFs that are unable to address bale quality issues may need to seek reprocessing markets in developing countries, like Vietnam, South Korea and Malaysia. This alternative may be the most cost effective option to address quality issues from some MRFs, but will come at a cost. They can anticipate competing against large quantities of available American single stream material for the remaining available reprocessing capacity and without well established relationships and the associated risks of shipping overseas, can expect challenges. It is important, therefore, that municipalities continue to monitor their operations and material quality given the ever reducing tolerance for contamination anticipated in all markets.

Landfill to Lifestyle: This Line of Furniture is Made Entirely from Post-Consumer Waste



A new entry to the eco-friendly furnishings market offers a collection of furniture and home accessories that comes with a bold set of standards. By focusing on turning trash into treasure, Pentatonic aims to demonstrate a better way forward for home furnishings than the standard of using virgin materials to create relatively short-lived products. We already have enough glass, plastic, and metals on the surface of the planet to make what is

needed, although mostly in the form of “the world’s most abundant and dangerous resource – human trash.” Pentatonic is tapping in to this waste stream for feedstock for its products, which are intended to be truly “circular” in nature, by virtue of being made from 100% recycled materials, being fully recyclable, and coming with a lifetime buy-back guarantee. For some perspective on just one aspect of the waste issue, it’s estimated that globally, about 480 billion plastic bottles were purchased last year, and that figure is rising, with some projections saying that by 2021, we may be buying more than 580 billion plastic bottles per year, and only a fraction of that is being recycled. A staggering 8.3 billions of tons of plastic has been manufactured since the ’50s, with most of it ending up in landfills or the oceans, which is said to be “smothering ecosystems in plastic.” Another common waste item from our era of affluenza is electronics, or e-waste, which can yield valuable metals and glass that don’t require mining or extensive processing to reclaim, but which often end up getting literally trashed instead of recycled. According to Pentatonic co-founders Jamie Hall and Johann Boedecker, the company aims to disrupt the furniture industry not only through its use of 100% post-consumer waste to craft its products “without compromising an inch on design, performance, or function,” but also by incorporating automotive manufacturing technology to build it. This is said to enable a scalable production process that also enables ‘localization’ by sourcing feedstock from near the production facility instead of from across the world. To read the full story, visit <https://www.treehugger.com/eco-friendly-furniture/furniture-made-entirely-post-consumer-waste.html>.

Ontario Making It Easier for Businesses to Buy Green Vehicles

Ontario is helping businesses buy low-carbon vehicles and technologies that reduce emissions and foster sustainable development -- and the province is seeking public input. This investment is part of Ontario's Climate Change Action Plan and is funded by proceeds from the province's cap on pollution and carbon market.

The new program will provide rebates towards the purchase of alternative-fuel vehicles and fuel-saving technologies, making it more affordable for local businesses to own and operate greener vehicles. Eligible vehicles and devices being considered under the program include electric and natural gas-powered trucks, aerodynamic devices, anti-idling devices and trailer refrigeration units.

The program will encourage more businesses to make the switch to low-carbon vehicles to reduce greenhouse gas emissions from transportation, a sector that generates about a third of Ontario's total greenhouse gas emissions.

Fighting climate change and reducing greenhouse gas emissions in Ontario is part of our plan to create jobs, grow our economy and help people in their everyday lives.

QUICK FACTS

The province is seeking feedback on the proposed Green Commercial Vehicle Program design, eligibility criteria, application and funding process, data collection, and innovation pilots. The program is posted for public review and will be open for comment until October 6, 2017.

In 2015, the transportation sector accounted for 33 per cent of Ontario's greenhouse gas emissions. In that same year, 31 per cent of Ontario's total transportation sector greenhouse gas emissions came from the road-based movement of freight.

Greenhouse gas emissions from road-based movement of freight in Ontario have doubled from 1990 to 2014.

The Climate Change Action Plan and carbon market form the backbone of Ontario's strategy to cut greenhouse gas pollution to 15 per cent below 1990 levels by 2020, 37 per cent by 2030 and 80 per cent by 2050. The government will report on the plan's implementation annually and review the plan at least every five years.

Natural gas vehicles and engines are powered completely by natural gas (this includes compressed natural gas (CNG), liquefied natural gas (LNG) and renewable natural gas (RNG)). They are used in a variety of applications, including long-haul vehicles, waste collection vehicles and vocational vehicles. As they offer slightly less potential for GHG reductions compared to electric vehicles, incentive amounts available are slightly less.

Rebates are available for any class 6-8 vehicle (GVWR of 8,846 kg or over) that is a new vehicle with an engine that operates solely on natural gas. These vehicles are eligible for a rebate worth 30% of the incremental costs associated with the engine and fuel system as compared to an equivalent conventional vehicle, up to a cap of \$30,000.

Some examples of MTO-approved natural gas vehicles that are eligible for funding under the Program will be available on the Program website. The eligibility of other natural gas vehicles not on the list will be assessed by MTO through information provided in the application.

What would happen if everyone recycled?



Experts say, not only would the world look a lot different but the recycling industry could add billions of dollars to the global economy.

The world would look a lot different if everyone recycled. Most likely, it would be cleaner and make more use of available resources. Landfills would shrink tremendously. Recycling plants would be an epicenter of activity.

“As a society, if everyone recycled we will have moved from a linear ‘take, make, waste’ economy to one that is more circular by keeping materials in our economy and not allowing them to waste away in landfills,” Brenda Pulley, senior vice president of recycling with Keep America Beautiful, wrote via email. “It would contribute enormous environmental, economic and social benefits across the country.”

Here are a few ways the world might change if everyone recycled:

Plastic water bottles, aluminum cans and plastic bags would go a lot farther.

Keep America Beautiful compiled data to imagine what just one act of recycling by everyone in the U.S. might look like:

If everyone in America recycled just one plastic bottle, those materials could make more than 54 million T-shirts or about 6.5 million fleece jackets, according to Repreve data.

If everyone recycled one aluminum can, 295 million new aluminum cans could be made, according to Aluminum Association data. Also, everyone recycling just one can would reduce green house gas emissions equivalent to taking 6,750 passenger cars off the road and save energy equivalent to 80 thousand barrels of oil. Keep America Beautiful used the EPA WARM model to calculate energy estimates.

If everyone recycled one plastic bag, those materials could be reused in making 28,906 park benches or, according to Tex data, 144,530 16-foot composite deck boards. Right now, plastic bags must be taken to a drop-off location for recycling and shouldn't be mixed in with other recyclables.

With so many substances flowing through recycling plants, new products would be created. Chaz Miller, director of policy/advocacy with National Waste and Recycling Association, said that extent of recycling would create "products you and I haven't dreamed about."

Everyone could save money.

The Bureau of International Recycling, a global recycling organization based in Belgium, believes recyclables should be recognized as the seventh most important resource, behind water, air, coal, oil, natural gas and minerals. BIR President Ranjit Baxi said recycling has not only environmental benefits, but also paramount economic ones.

Efficient recycling practices could save companies millions. In Apple's latest Environmental Responsibility Report, the company said it recovered more than a ton of gold from recycled devices — that's an estimated worth of \$40 million.

Recyclables would always go in the proper cans.



The greatest obstacle of recycling in America is contamination: People mixing recyclables and trash, unsure of the process. Here are current EPA guidelines on how to recycle.

"The chance that all of us would be perfect recyclers is pretty slim," Miller said. "For us to recycle everything implies that we've figured out a way to take all of the recyclables out of mixed garbage."

Everyone would have to know and abide by a streamlined recycling process.

The Great Pacific Garbage Patch, also known as the Pacific trash vortex, would be no more. (However big or small it is.)

Miller estimates the U.S. would need "a couple thousand" facilities to process materials, which could also affect the workforce. If the U.S. alone reached a recycling level of 75%, 1.5 million new jobs would become available, Recycle Across America reports.

The cost of plastic packaging

The growing use of plastic food packaging benefits consumers, but critics say industry isn't doing enough to minimize the negative environmental impact



More and more of the food available in the store comes in high-tech plastic packaging such as multilayer films.

The changes have happened so gradually that most consumers haven't even noticed, but a tremendous amount of plastics have crept onto supermarket shelves. Shoppers are tossing a lot of plastic packages into their carts that didn't exist when they were kids. Cucumbers sleeved in polyethylene film are now ubiquitous in the produce department, as are sliced fruits in polyethylene terephthalate (PET) containers and chopped, ready-to-eat salads in polypropylene bags. People don't have to make their own guacamole or hummus anymore—it comes already prepared in convenient polypropylene tubs.

Resealable plastic pouches, made from sophisticated multilayered films, are all over the supermarket. Shoppers can spot them on dry goods shelves containing granola, brown sugar,

and beef jerky. They hang in refrigerator cases displaying shredded cheeses and cold cuts and are stacked in freezers filled with chicken, fish sticks, and french fries. Even tuna is starting to come in easy-to-open metallized pouches instead of the familiar stout can. Vacuum-packed steak, ribs, and chicken are a growing presence in meat department cases.

Plastic packaging is taking over the supermarket, enveloping almost every food product we buy. Environmental activists say the material is causing the planet huge environmental damage and that the chemical industry should do more to make packaging easier to recycle. Industry acknowledges a need to improve but says it is combating an even bigger environmental challenge, food waste. C&EN's cover story this week looks at this contentious debate, including ways in which the two sides are edging closer together.

Many industry critics think all these plastics are a bit much. "It's so immensely curious how stupid modern packaging is," William McDonough, a designer and sustainability guru, told a greenbiz.com reporter a few years back.

To McDonough and like-minded critics, flexible plastics, especially the newer multilayered films, are another excess of a throwaway society. They are much harder to recycle than the simpler metal, paper, and glass containers they replace. Too many of the new materials end up in landfills or bobbing around the ocean. And they make it all too easy for people to simply discard things without a thought to the damage they are doing to the planet.

The packaging industry, though, doesn't think its products are so stupid. It sees plastics as a solution to another big environmental problem: food waste. Flexible plastics don't shatter or dent, and if they are

well-engineered, they don't rip or puncture either. Their multilayered structures ensure long-term preservation of the food inside. And they are lighter and cheaper to transport than metals or glass.

"Plastic packaging today is so much more than a shopping bag or wrapping," says Cindy Shulman, vice president of packaging and resins for ExxonMobil Chemical. "It really is about preservation and protection of food and getting it to people."

At the same time, the industry can't help but acknowledge the negative consequences of plastic waste. Companies are responding by making plastics thinner, saving on materials and environmental impact. They're also beginning to make packages simpler and thus easier to recycle. With such steps, they hope to head off a serious backlash.

Consumers enjoy the convenience of plastic packaging even if they don't realize the amount of engineering that goes into the multilayered structures. "There isn't that awareness, even in the packaging industry," says Jeff Wooster, global sustainability director for Dow Chemicals packaging and specialty plastics unit. "If you talk to someone whose expertise is designing corrugated containers, they might not understand why we use more than one plastic to make a package."

But all those polymers in packaging film are there for their own special reasons. The workhorse is polyethylene, explains Susan Selke, director of Michigan State University's School of Packaging. "As a general rule, if polyolefins will do the job, then they will be the least expensive," she says.

Polyethylene gives the package its bulk and structural integrity. If more toughness is needed, a packaging company might opt for PET, the resin of choice for beverage containers. Polyethylene can also be used to seal the package. But often lower-melting-point ethylene-vinyl acetate is the better choice for that. And if the food inside the package is greasy, a food company might opt for a higher-end sealant such as DuPont's Surlyn.

Most food packages need a barrier layer to protect against oxygen. Ethylene-vinyl alcohol (EVOH) is popular because it is more effective in blocking oxygen than polyethylene, PET, or nylon. If even more barrier is needed, a package might incorporate metallized film, Selke says.

To explain what flexible packaging brings to the food industry, experts often point to two examples: cucumbers and meat.

Shoppers may wonder what the heck plastic is doing on cucumbers, which did fine on their own for many years. But the polyethylene shrink wrap protects the surface of the cucumber and helps it retain moisture. According to the Flexible Packaging Association (FPA), the film extends the shelf life of a cucumber from three days to 14.

The steaks that consumers buy in the supermarket are usually packaged by the store's own meat department in polystyrene foam trays and a film such as polyvinyl chloride. Distributed this way, FPA says, steaks generally last four days. If the meat is processed centrally and vacuum-packed in a multilayer film that includes an EVOH barrier, it can last for nearly a month.

Environmental advocates acknowledge the benefits that multilayer packages bring. Unlike other contentious products of the plastic industry, such as plastic bags and polystyrene foam, they aren't being targeted for outright bans. But environmental activists argue that the industry should do something about the packaging waste that is mounting in the environment.

Everyone acknowledges that multilayer flexible containers are more difficult to recycle than simpler packages like aluminum cans or PET bottles. The layers can't be separated, so they are shredded and re-extruded into plastic pellets together. Often they are relegated to lower value uses such as plastic lumber for park benches rather than new packages. Activists think of such downgrading, called cascaded recycling, as a last resort.

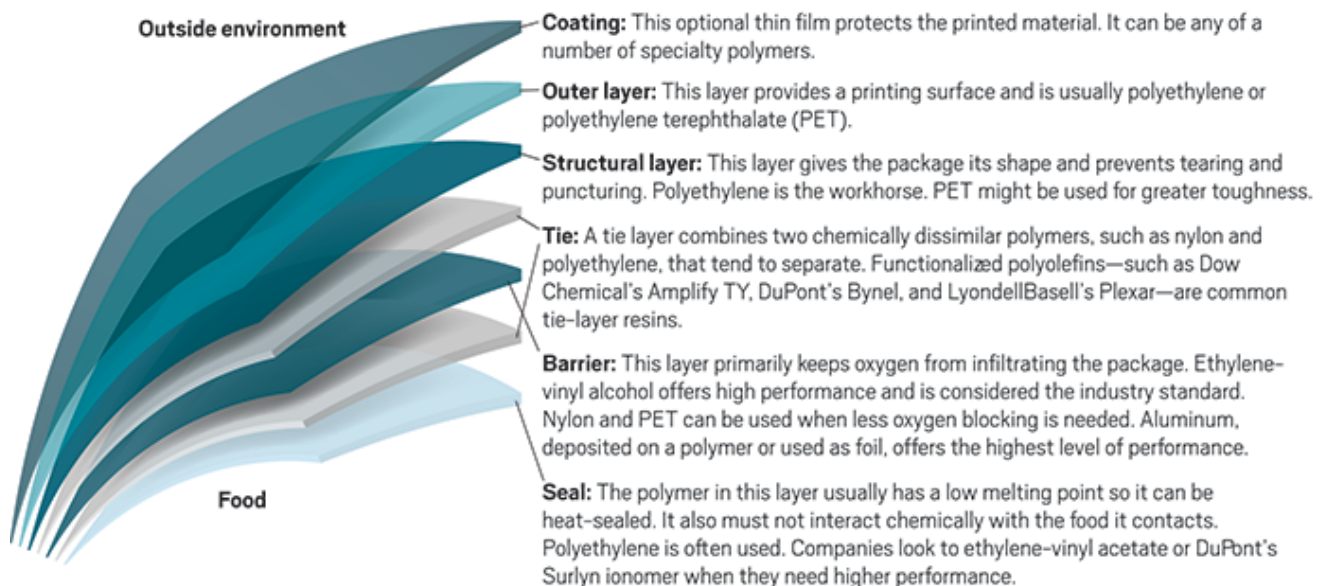
In January, the Ellen MacArthur Foundation released a report that quickly became influential. “The New Plastics Economy: Rethinking the Future of Plastics” attempts to reconcile industry and activists on the packaging issue. The report was the product of input from environmental groups like Ocean Conservancy as well as companies important to packaging such as Dow, the consumer products company Unilever, and the packaging firm Amcor.

“The New Plastics Economy” details the scale of the packaging waste problem. In 2013, industry produced 78 million metric tons of plastic packaging worldwide. Of that, 40% was landfilled and another 32% was “leaked” to the environment, polluting land and sea.

Only 28% of the plastic, the report says, was collected for further use. Half of that was incinerated for energy. The other half was recycled. After processing losses and cascaded recycling, just 2% of the original 78 million metric tons was recycled into the high-value applications it originated from.

Between the small amount of plastics collection and the lower value uses, only 5% of the packaging’s original value was retained. Losses to the economy because of the current system run as high as \$120 billion per year.

Each component of a flexible multilayered package imparts important functions to the overall architecture.



Note: The example is generic. Various products and environments require different arrangements of layers.

“You have this highly engineered package that is used for maybe a few weeks, and then it sits for hundreds of years at a landfill,” says Conrad MacKerron, senior vice president of the corporate responsibility group As You Sow, who was a consultant for the Ellen MacArthur Foundation report. “Whether you are an environmental advocate or not, it is a waste of materials that have significant value. That’s not good business.”

These economic losses aren’t the only problems with plastic waste cited by the report. It points to the estimated 150 million metric tons of plastics currently residing in the world’s oceans. Packaging accounts for more than 60% of the plastics recovered in coastal cleanup operations. “Without significant action, there may be more plastic than fish in the ocean, by weight, by 2050,” the report says.








The environmental costs of packaging add up. Trucost, a consulting group that tabulates the environmental impact of business practices in dollar terms, conducted a study on behalf of the United Nations Environment Programme in 2014. Its report, “Valuing Plastic: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry,” looked at costs such as disposal and greenhouse gas emissions.

The report found the environmental cost of using all plastics to be \$75 billion annually. The food and soft drinks sectors were the biggest contributors, accounting for 23% and 12% of the overall impact, respectively.

The cost of plastic packaging is high, but the cost of not using it may be higher. Ask any packaging industry official about sustainability, and food waste will come up quickly.

Indeed, the food waste issue is connected to some staggering statistics of its own. The world wastes a third of the food it produces, 1.3 billion metric tons per year, according to the Food & Agriculture Organization of the UN. In the U.S. alone, \$165 billion is spent producing food that goes to waste, says the Natural Resources Defense Council, an environmental group. Manufacturing the wasted food accounts for 25% of U.S. freshwater use and 4% of U.S. oil consumption.

Flexible plastic packaging allows more food to get from the farm to the table.

	Original packaging	New packaging	Result
 Bananas	Sold loose	Perforated polyethylene bags	Lasted 15 days unpackaged versus 36 days in bags
 Beef	Polystyrene foam tray with cling wrap	Vacuum packing in oxygen barrier film	Shelf life extended from four days to up to 30 days
 Bell peppers	Sold loose	Modified atmosphere packaging with perforated polypropylene film	Lasted four days sold loose versus 20 days in packaging
 Bread	Paper bag	Biaxially oriented polypropylene film	Food waste reduced from 11.0% to 0.8%
 Cheese	Sliced at counter and wrapped in paper	Polyester tray with a polyethylene and polyester lid	Food waste reduced from 5.00% to 0.14%
 Cucumbers	Sold loose	Polyethylene shrink wrap	Shelf life extended from three days to 14 days
 Grapes	Sold loose	Perforated bags	Bagging leads to a 20% reduction in in-store waste

Sources: Denkstatt's "How Packaging Contributes to Food Waste Prevention" (cheese, bread), McEwen Associates/ Flexible Packaging Association's (FPA) "The Value Of Flexible Packaging in Extending Shelf Life and Reducing Food Waste" (bananas, bell peppers), Packaging Technology Integrated Solutions/FPA's "The Role Of Flexible Packaging in Reducing Food Waste" (beef, cucumbers, grapes)

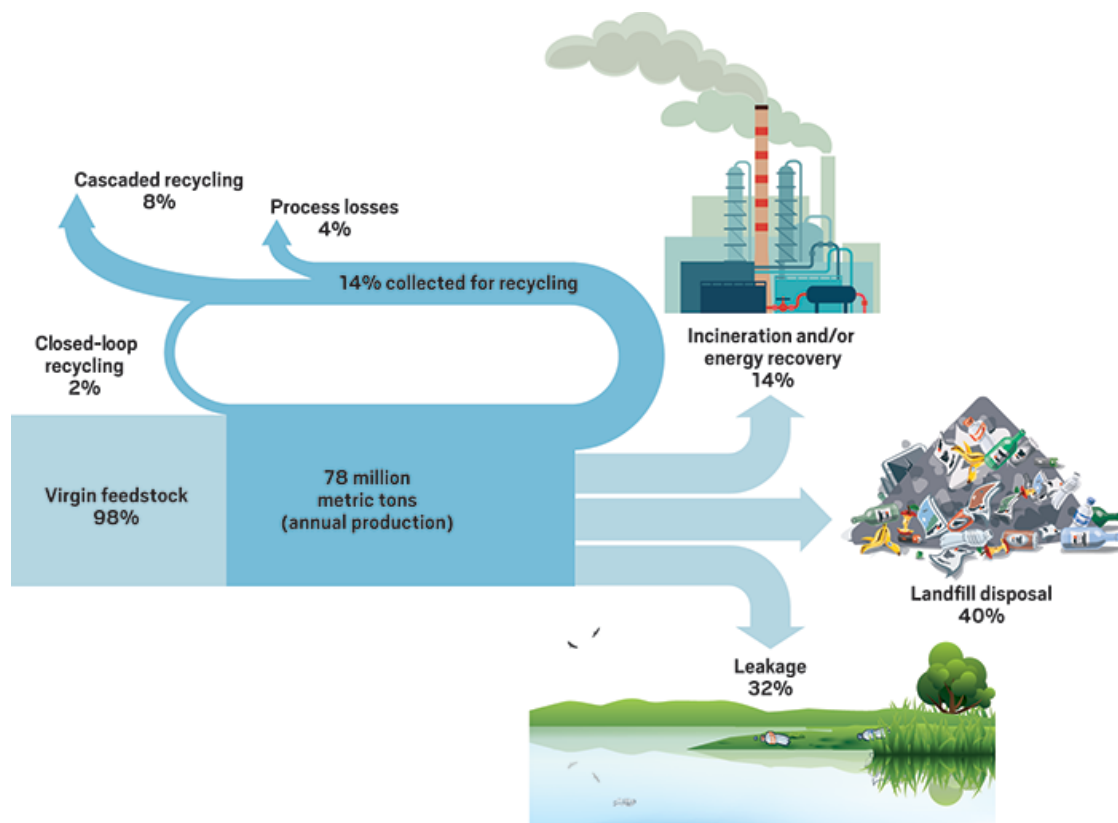
An oft-cited industry rule of thumb is that packaging represents only 10% of the energy required to make and deliver food to the consumer. This figure is from an Industry Council for Packaging and the Environment report that includes nonplastic packaging such as the cardboard boxes used to transport food.

Any reduction of that 10% can't come at the expense of the other 90%, plastics advocates point out. "The most important thing we can do for sustainability is protect the food inside," Dow's Wooster says.

Improved food protection through better packaging can yield real environmental benefits. The Austrian consulting group Denkstatt looked at steak packaged in a vacuum skin instead of the traditional combination of foam tray and film. Food waste declined from 34% to 18%, resulting in a 2,100-g CO₂-equivalent greenhouse gas reduction per steak. In a recent study, Trucost took this example further and found a \$606 decrease in environmental costs per metric ton of steak.

Generally, pricey foods such as meat reap a bigger benefit from packaging because they are more resource-intensive to produce than bulk goods such as rice. Dow's Wooster sees that in the supermarket. The meat and cheeses on display around the perimeter of the store tend to have higher-tech packaging than the goods in the interior, where glass bottles, metal cans, and paper sacks still flourish. "The companies that deliver meat to the market are generally willing to invest in the packaging that extends the shelf life," he says.

Little plastics packaging is recycled, and much of it ends up as litter.



Source: Ellen MacArthur Foundation's The New Plastics Economy: Rethinking the Future of Plastics

As You Sow's MacKerron gets the arguments, but he suspects the industry has gone too far with all the plastics. "It really raises questions in my mind whether we are looking at overpackaging in some cases," he says. Why must food last two years when six to eight months might do just fine? he asks.

David Clark, vice president of safety, environment, and sustainability at Amcor, says such instances are rare. "Our customers aim at delivering the most value to consumers," he says. "They are not going to look for excessive packaging or to try to overpackage anything." Amcor has a database of 4,885 life-cycle assessments (LCAs) of packaging. Most of them, he says, justify the use of plastics.

Even packaging that may seem over-the-top to the layperson can stand up under closer scrutiny. Take K-Cup-style single-serve coffee capsules. The LCA firm Quantis Canada conducted a study for the PAC Packaging Consortium, an industry group, comparing their impact to that of drip-brewed coffee. It found that under the best-case scenario, where drip-brewed coffee wasn't wasted, the two come out even. And because the capsules offer portion control, they come out ahead when dumping old coffee from the pot is considered.

Amcor is also in the business of paper and aluminum packaging and for many years made glass bottles and aluminum cans, Clark points out. When compared side by side with these materials for packaging applications, he says, "plastics usually come out ahead."

Earlier this year, Trucost followed the report it conducted for the UN with one commissioned by the American Chemistry Council, a trade association. "One of the questions was whether it would help reduce environmental costs if we switched away from using plastic," says Libby Bernick, senior vice president at Trucost. "In fact, it wouldn't help at this point, given the environmental costs of the alternative materials. It would make things worse."

The company compared plastics with a basket of materials such as aluminum, paper, and glass. It found that the environmental impact of the alternatives was better than plastics per kilogram. However, in most applications, much less plastic is needed. In food packaging, for example, 4.6 times the amount of alternative materials is required to do the same job as plastics.

Such comparisons don't absolve the industry, As You Sow's MacKerron points out. "If consumer brands are putting disruptive materials onto the market, they need to somehow pay for or take responsibility for post-consumer collection and recycling," he says. "I don't think you can just say, 'Your LCA says it has fewer greenhouse gases so it's okay.'"

Industry ownership of the problem is a big part of the "New Plastics Economy" report. The emphasis is on a circular economy, in which the industry cultivates a supply chain for used materials so they will be reused—ideally in their original, high-value applications. The report calls on industry to simplify the materials it uses in multilayer packaging. It suggests a "search for a 'superpolymer' with the functionality of today's polymers and with superior recyclability."

Combining toughness, flexibility, barrier properties, and other attributes into a single polymer is probably a long way off, but the industry is trying to simplify packages to facilitate recycling.

Dow, for instance, has developed a stand-up pouch made entirely of polyethylene. The package, Dow's Wooster acknowledges, doesn't have great barrier properties. But it does have one food application, Tyson frozen chicken sold in Mexico, and it's being rolled out for a big nonfood use: Seventh Generation dishwasher pods.

Bernard Rioux, who heads global marketing for DuPont's packaging resins business, says a single superpolymer may be unnecessary because different kinds of polyolefins can be recycled together. "Meat packaging can be purely polyolefin based," he says. Rioux adds that one good step in the

direction of single-polymer packaging would be getting rid of the metallized layers needed for high-barrier packaging.

Amcor's AmLite technology is precisely along these lines. It involves applying a micrometer-thick silicon oxide layer to a polyolefin film. The silicon oxide has a lower carbon footprint than aluminum and performs just as well, Amcor's Clark says. "It is essentially like a thin layer of glass on the inside of the plastic."

Juice pouches and other flexible packages made with the AmLite technology can have a 40% smaller carbon footprint than conventional metallized pouches, according to Clark. Similar technology is already used in plastic wine bottles, where it reduces the weight of the bottles by up to 90% and allows for 30% more wine to be loaded onto each truck. In rigid applications, Clark claims, the technology has also proven to be more compatible with recycling than polymer barriers.

Applications such as this that use less material are the plastics industry's go-to strategy for minimizing cost and environmental impact. According to Trucost, if the industry could reduce materials consumption in food and beverage applications by 30%, \$7.3 billion in environmental costs could be avoided.

To do that, chemical companies will have to come up with materials that can do the same job with less. This is one of the reasons tougher, metallocene-catalyzed polyethylene has been gaining in popularity.

According to ExxonMobil's Shulman, one classic failure that occurs in plastic packages, such as large sacks for rice, are pinholes that come from the stress of shipping. With newer high-performance polyethylenes such as ExxonMobil's Exceed XP, "you no longer get those holes," she says.

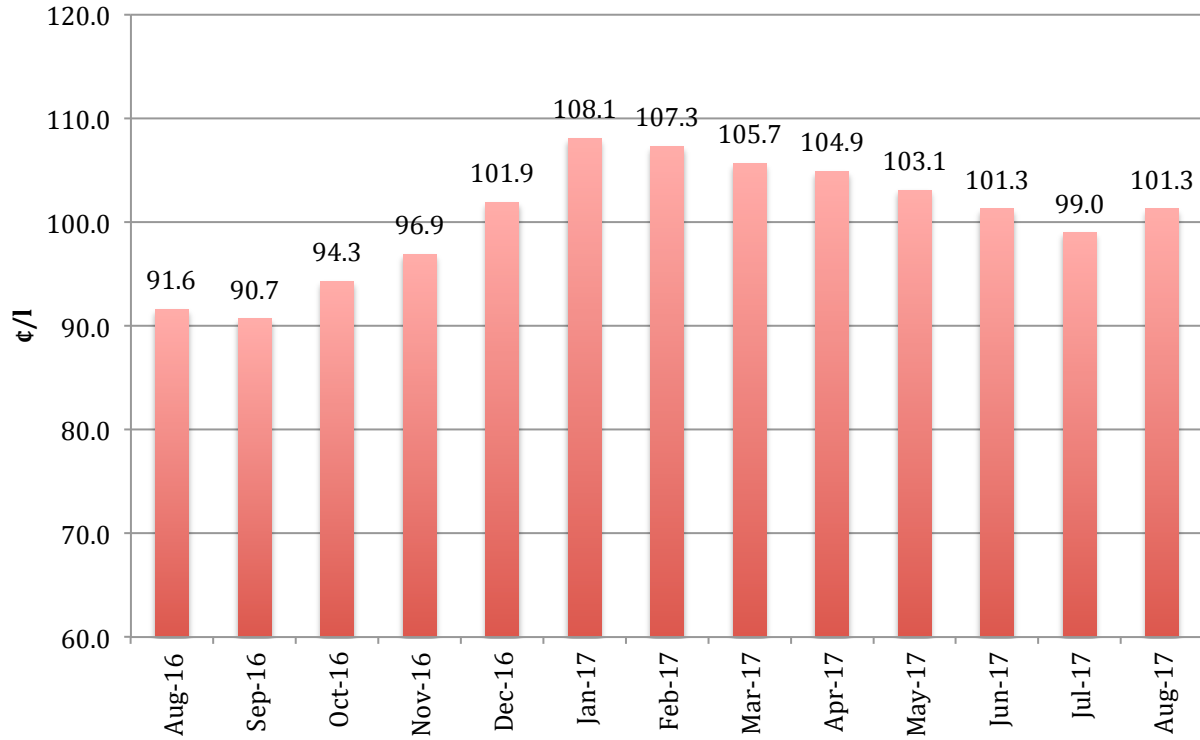
That same quality, Shulman says, allows companies to downgauge a product such as the shrink wrap for beverage six-packs by about 50%. Compared with a cardboard carton, she adds, such a wrap delivers a 70% reduction in greenhouse gas emissions.

DuPont's Rioux says the industry is reaching the limit in terms of how much traditional downgauging it can do. He advocates another emerging approach to making films thinner, called coextruded biorientation.

Biaxial orientation—stretching polymer films to align their polymer chains—is not new. Biaxially oriented polypropylene is used in most potato chip bags. But it hasn't been used on multilayered film until now. The trick, Rioux says, is keeping the polymers in the amorphous state during the melt phase to prevent crystallization. "You have to control 50 different parameters to make it work. But it works," he says.

Premium plastics made with coextruded biorientation might not be the "superpolymers" the "New Plastics Economy" report had in mind, but they do help ease the environmental burdens of plastics. Industry and its critics may disagree on a lot, but no one can argue with charging good money for a plastic that will only be used in small amounts.

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