Top Takeaways and Outstanding Questions from the Multi-Laminate Packaging Webinar

Featuring Rebecca Casey from TC Transcontinental, Larry Effler from Dow Packaging, Marc Girard from Maple Leaf Foods, and Jay Stanford from the City of London

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1 There is ongoing need for packaging value chain collaboration to identify and implement solutions for hard-to-recycle plastics -- solutions that improve sustainability by reducing negative environmental impacts such as GHG emissions and plastic pollution.

2 Research conducted with consumers 18+ who are responsible for food and beverage shopping said that maintaining freshness, resealability and recyclability are the three most important packaging elements when choosing food/beverage elements.

3 In keeping with the consumer priority of freshness, a barrier of choice is EVOH with its relatively low oxygen permeability compared with alternatives.

4 Companies are innovating with a variety of tools to improve the recyclability of multi-laminate, multi-material films: mono-material (multi-laminate) designs, protective coatings, compatibilizers, sealants and more.

5 There is also innovation with caps and closures to: move to a single material for both closure and 'body', reduce material use, and incorporate higher percentages of recycled content.

6 Critical factors for successful mechanical recycling include: consistent availability of high quality PCR feedstock, the technical capability (e.g. compounding) to work with that feedstock, and the ability to find suitable applications for it.

7 While mechanical recycling is critical for successful material recovery, it's important that a variety of options be considered in order to further displace primary materials with high quality secondary materials.

8 London, Ontario's Hefty Energy Bag Pilot program started in October 2019 and involves 7,000 homes with curbside service, 6,000 homes that have access to Drop-off depot service and 200 apartment building units in the collection of hard-to-recycle plastics (e.g. chip/snack bags, meat and cheese plastics, pet food bags, etc.). The purpose is threefold: divert more plastics from landfill, reduce the amount of mismanaged plastics, and advance toward a more circular plastics economy and sustainable future. In two surveys, program participation averaged about 40% with one area reaching 50% participation. These rates are viewed positively since the program is only 7 months old.

Outstanding Questions

There were a number of questions we couldn't get to during the webinar, and thanks to our presenters for fielding a number of them as part of our followup.

For the recycle ready product can we use a standard adhesive to laminate 2 films and claim that the product is recyclable?

According to the APR Design Guide: adhesives that are non-water soluble/ dispersible adhesives are detrimental to recycling. If the laminated materials are different the structure may not be recyclable. If the materials are derived from the same polymer and laminated with adhesive the structure may need to be evaluated to understand whether it can be deemed recyclable.

Why isn't PVDC considered sustainable and has there been broad movement away from it as a barrier?

PVdC, a variation of polyvinyl chloride (PVC), has the potential to release carcinogenic dioxins when incinerated. There are also concerns that PVdC packaging could pollute the recycling stream if mingled with recycled materials: https://www.manufacturing.net/home/article/13182563/qa-improving-sustainability-without-compromising-quality

Many film vendors have moved away from PVdC replacing it with EVOH.

What are packaging companies doing to get their own plastic packaging feedstock back? In one of Dow's slides consumer use, waste collection and MRF's all go to landfill. If it's cheaper or contaminated haulers and MRFs just landfill it. How are packaging companies investing to get their feedstock back?

Dow is committed to seeking and bringing circular solutions to the marketplace. We believe a multi-functional, multi-pronged approach is necessary to bring a suite of solutions forward, so that communities, haulers, and others in the value chain can engage with the solution that best suits their needs.
Dow has been working on several initiatives to create collection systems to

recover packaging materials as well as creating and growing the end markets for the recycled materials. These initiatives include supporting the How2Recycle Store Drop Off system, the ACC's WRAP program, the Materials Recovery For the Future (MRFF) and the Hefty Energy Bag Program. In addition, we recently established a supply agreement with Avangard Innovative to secure PCR pellet for development and use in Dow products.

If printed films cannot be recycled unless ink can be removed, what are the solutions that are offered if we want to make recycle-ready structure using a printed film? Is there another way to make it recyclable ready without removing the ink?

Printed films and packages can be recyclable and many printed films are recycled, e.g. collation shrink and towel and tissue over wrap films. In most cases, reclaimed printed film results in a gray-colored recycled pellet. This colored recycled pellet holds a lower value compared to a pristine, clear pellet from unprinted film, but it is still recyclable and has end markets.

Perhaps some clarity around the terminology used in the APR PE Film Design Guide which lists four categories for a package/film structure may help:

- Preferred – Structure is readily recyclable and markets are available. An example includes clear films without labels.
- Detrimental – Recyclable but contains a feature that is technically challenging or devalues the recycled product. This could include printed and pigmented films. Review with recycling experts is recommended to establish recycling viability.
- Non-Recyclable
- Requires Testing – possibly too many unknowns of its effect on the recycling streams. Screening and guidance tests are available to evaluate materials based on industry standards.

Can you provide any examples of recyclers in Canada & US that actually recycle your recyclable PE (with EVOH) flexible pouches? Not take-back programs but actual recyclers. And what is made from that recycled material?

I would suggest contacting APR, the SPC or the Canadian Plastics Industry Association (CPIA) for a list of recyclers that accept plastic films, as this can vary by collection method and region.

I would love to know more about the recyclability testing procedures and the steps required to certify that a packaging is recyclable (whether is it testing with Material Recovery Facilities or sorting technology providers, etc.)

The Association of Plastics Recyclers (APR) recently approved a PE Film Critical Guidance Test Protocol to complement their other testing protocols for rigid PE containers. The list of all their test protocols including sortation can be found at https://plasticsrecycling.org/apr-design-guide/test-methods.

The examples of products manufactured from Energy Bag material you showed would imply that materials were mechanically recycled. Is any of the material sent to energy from waste applications?

The details below describe our end-markets. We are not looking at conventional energy-from-waste facilities.

Mixed Plastics Recycling
The Hefty® EnergyBag® team continues to collaborate and innovate with local manufacturers and recyclers to ensure that London's Pilot Project, as well as Hefty® EnergyBag® programs across the United States, have suitable end-markets for the collected materials. The team is evaluating alternatives that include the manufacturing of durable composites that could be used as construction materials, plastic lumber, railroad ties, decking, siding, pallets, roads, fillers, outdoor furniture and concrete aggregate in building blocks.

Existing and/or potential local end-markets for hard-to-recycle plastics from London's Pilot Project include:
- Composite plastic lumber, outdoor furniture
- Aggregates for incorporation into concrete blocks

Chemical or Molecular Recycling / Conversion Technologies
When mechanical recycling end-markets are not available, chemical or molecular recycling/conversion technologies that turn plastic into energy sources or feedstock for fuels and products will be used. This a revolutionary new recycling technology that de-polymerizes the plastic returning it to its original molecules so that it can be recycled to infinity.

There are generally two different technologies used - pyrolysis and gasification.

In pyrolysis, plastic waste is heated (not combusted or burned) in the absence of oxygen to produce liquid mixtures that are like synthetic crude oil. This can be further refined into transportation fuels and potentially into chemical feedstocks and basic chemical elements that could be used to make new virgin polymers/ plastics.

Gasification involves heating the waste plastic with air or steam to produce valuable industrial gas mixtures called synthesis gas, or "syngas." This can then be used to produce fuels, fuel additives or valuable chemicals such as ethanol and methanol.

Pyrolysis and gasification are alternative processes to directly combusting (burning) the plastic. Conversion technologies are chemical reactions and have very low emissions. They do not use direct combustion like energy-from-waste (EFW) and have much lower emissions of sulfur and nitrogen oxides than EFW combustion.

The main goal of energy-from-waste (EFW) is to dramatically reduce the volume of materials that would require landfilling. The heat released from EFW is used to produce steam to drive a turbine and generate electricity but this is really a by-product of the process.

Pyrolysis and gasification produce electricity, fuels and ultimately chemicals to make new plastics. These processes provide additional options for extending the life of valuable plastics other than EFW.

Solid Recovered Fuel
Hard-to-recycle plastics can be used as an alternative fuel source in the manufacturing of cement. The embedded energy value of plastics offset the use of virgin fossil fuel sources such as coal and coke.

The materials collected via the Hefty® EnergyBag® program in other locations have proven suitable as solid recovered fuel given its high heat value. The materials collected can also be compressed into solid fuel pellets or flakes.

Do you happen to know the composition of what is in the hefty bag?

This work is underway in London and not finalized yet. Based on past experience, the composition mix is likely to be along these lines:

PE	50 to 60%	PET	4 to 14%
PS	8 to 12%	Paper	4 to 10%
PVC	0 to 2%	Aluminum	0 to 1%
PP	9 to 15%	Other	4 to 6%

The main issue with standup pouches seems to be at the MRF's, correct? Their initial sorting wheels deflect it, as it is completely flat, up into the paper stream where it will be removed and presumably discarded as a contaminant. I have seen trial technologies to identify plastics that comply (and those that don't) using invisible bar coding (Digimarc) and modified in-line sensors. What are your thoughts on this measure to recycle the packaging materials of those that produce single polymer standup pouches and those that don't comply?

This one is a big discussion point. If materials can be mechanically recycled because they are single polymer and there are enough of them, then this seems wise to do at the MRF level. I am not aware of too many MRFs doing this right now in North America. What is key to understand with the Hefty®EnergyBag® is that it captures a wider variety of plastic items with a goal of doing very little additional mechanical or manual sorting at the local MRF. Technologies in this field are in the infancy stage. The key will be large quantities of materials feeding large regional facilities tied closely with final end users. It can be done but requires commitment of many and a fair bit of collaboration.