WEBINAR #3 BRIEF

Mechanical Recycling Innovations for Flexible Packaging

INTRODUCTION TO THE REDUCING PLASTIC WASTE IN CANADA PROJECT

The two-year project aims to deepen knowledge and strengthen the implementation of solutions to reduce plastic waste in Canada through knowledge sharing and peer-to-peer exchanges with European Union (EU) counterparts. The project is part of the Circular Plastics in the Americas Program as part of the EU commitment to the UN Sustainable Development Goal to support the transition toward sustainable production and consumption.

OBJECTIVE OF WEBINAR #3

The third Webinar in the series on flexible plastics circularity explores how mechanical recycling technologies and facilities are adapting to recover polyethylene and polypropylene flexible packaging.

SPEAKERS

Crystal Howe
Ice River Sustainable Solutions
Moderator

Dana Mosora
Circular Economy for Flexible Packaging
CEFLEX
Speaker

Monica Battistella
Taghleef Industries
Speaker

Romain Cazenave
Dow Europe
Speaker

Crystal Howe, Ice River Sustainable Solutions

Crystal Howe provided a brief overview of the importance of both market signals and collaboration to drive meaningful change in the circular economy. She highlighted the steps taken by Canadian water bottling company Ice River to advance towards their circularity goals. Ice River funded the building of a dedicated recycling facility for polyethylene terephthalate (PET) in Canada, and now this facility recycles the majority of the PET collected in the Canadian market, leading to a more circular water bottle. The packaging designed and used by Ice River is made from 100% recycled PET.

Ms. Howe introduced the webinar speakers who represent leading examples of research advances and collaboration to in Europe to improve the recyclability of flexible plastics.

Dana Mosora, Circular Economy for Flexible Packaging (CEFLEX)

Mrs. Mosora presented the key elements of the Circular Economy for Flexible Packaging (CEFLEX) roadmap (see Webinar #1 Brief) highlighting the actions needed by each part of the value chain to achieve the CEFLEX goals by 2025, which is an established collection, sorting and reprocessing infrastructure for post-consumer flexible packaging across Europe. Knowing what type and quantities of plastics are entering the market and what type and quantities are desired for end-markets is a key requirement for the advancement of solutions. This information is needed to trace the specific recycling pathways to deliver the quantities and quality specifications required to meet end market demands. Sorting capabilities can then be scaled up to meet recycling requirements, once they are known.

The collaborative research partnership **ValueFlex** was established to assess the opportunity to create value from recycling all flexible household plastic packaging while demonstrating commercial viability of new recycling technologies at scale. The **ValueFlex project** tested the application of new technologies such as (1) enhanced sorting using infra red technology for different resins; (2) wet washing for better removal of residues and labels/coatings, and; (3) extrusion with extra filtration to remove impurities and odors.

CEFLEX is currently working with industry partners with a goal of developing a full commercial scale demonstration plant to maximize the value captured from collection of all household flexible packaging, and then demonstrate commercial viability of this recycling at scale. They plan to include full polyethylene (PE) and polypropylene (PP) using both mechanical and chemical recycling.

Key messages:

- ⟶ Technologies exist to recycle flexibles and implementation at scale needs acceleration.
- ⟶ Design for recycling is a pre-requisite to maximize recycling rates and economic value in recycling.
- ⟶ Chemical recycling is the missing puzzle piece to increase flexible plastic recycling.

Monica Battistella, Taghleef Industries

Mrs. Battistella presented the results of a research project undertaken as part of ***CEFLEX's 5 Steps to Build a Circular Economy for Flexible Packaging*** under the third element "Redesign multi-material flexible packaging to mono materials with existing recycling streams". The research goal was to improve the mechanical recycling technologies for flexible polypropylene (PP), with the aim of ensuring stability of the properties of the film. The intent is to drive changes in packaging design upstream – leading to improved end markets for the material.

Trials were conducted in 2019 and 2021 with rPP films with post-consumer content from 0 to 32.4 percent. Various characteristics were assessed: aesthetical aspect (e.g., spots and aesthetic defects); mechanical properties such as tensile strength, elongation at break and elastic modulus; corona treatment level.

The analysis showed:

- ⟶ No significant difference in hot tack and seal strength
- ⟶ PCR material has a slight positive impact on the film thermal shrinkage
- ⟶ No significant influence on the rPP film flex content mainly on the force and energy

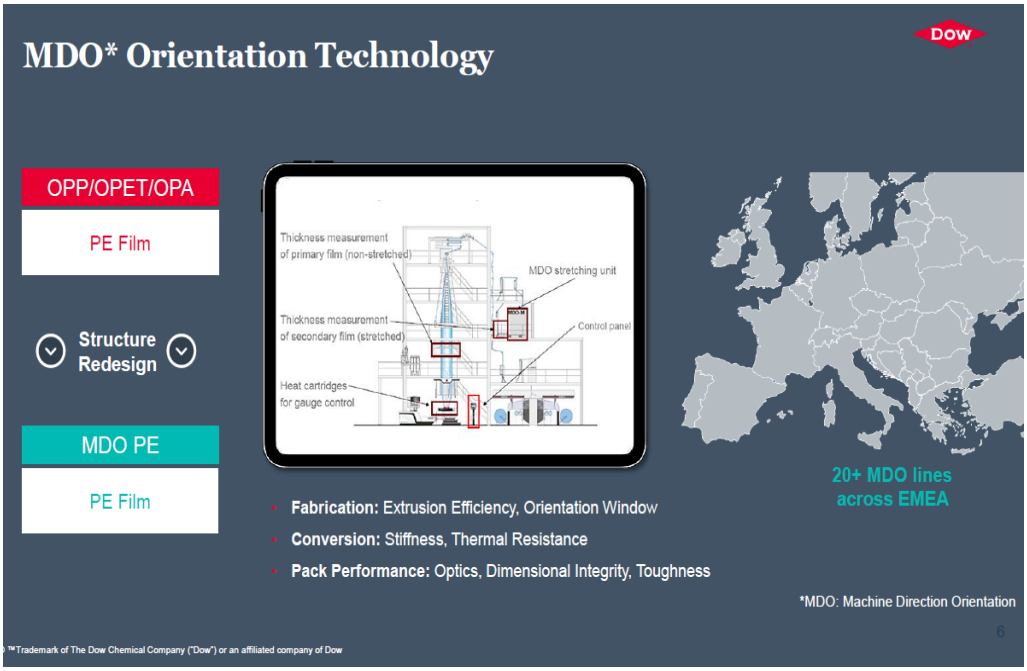
Overall, the results show that the aesthetic properties (e.g., opacity, appearance) and physical properties (e.g., elasticity, strength) of the film are stable in this recycling process, which make it suitable for potential end-use applications as a new material in new manufacturing. The conclusions of the research were that this type of film in this recycling process is suitable for recycling flexible plastics destined for non-food contact end uses, as the material could be used for many other pouch packaging applications.

Romain Cazenave, Dow Europe

Mr. Cazenave introduced Dow's strategic priorities: Protect the climate, Stop the Waste and Close the loop and noted that the key to accelerating flexible packaging circularity is collaboration through **Design for Recyclability**. Dow's goals is to enable 100% of packaging placed on the market to be recyclable by 2035. It is supported by action across five pillars of Dow's flexible plastics innovation portfolio: (1) Design for recyclability; (2) Mechanical recycling advancements; (3) Advancing recycling via chemical recycling; (4) Bio-based diversifying and expanding (not food-grade); and (5) Carbon neutrality. Challenges in realising this goal relate to the perception of plastics as fully recyclable and the need for collaborations and outreach to improve sorting, as well as the need for enhanced collection systems.

One new technology being implemented to improve packaging manufacturing to ensure recyclability is **Machine-direction orientation (MDO),** where a polymer film is heated to a temperature slightly below its melting point and stretched in a particular orientation. This technology can increase the thickness of a film, using only one resin therefore producing a mono material. A similar technology can be used to add a strengthening polymer to polyethylene (PE) to boost optical performance and strength. These technologies do not change the printing performance or speed production of the pouch package. This design change will lead to increased ability to collect flexible packaging in sorting and processing facilities and is already widely in use in Europe.

Dow products are already bringing several benefits in the MDO Print web such as remarkable stiffness, thermal resistance, broach stretching window and excellent options. In the sealant web they have demonstrated: stiffness, dimensional stability, formability, low seal initiation temperature and good operating window on the packaging line.



Key messages:

- Flexible packaging has multiple benefits: it is very efficient and lightweight (leading to less material use and lower emissions in production and transport)
- Flexible packaging recycling solutions already exist in Europe, collaboration among major brands is key to continued development and implementation of design for recycling solutions.

DISCUSSION Q & A

Questions from participants:

Design for recycling guidelines under development in Europe:

- Will guidelines apply to multiple sectors of packaging waste. Answer: the guidelines are developed for the package as a material, not sector-specific, although typical consumer / household packaging waste was the source of new technology development.
- Are guidelines different depending on the type of recycling (chemical or mechanical). Answer: design guidelines are developed upstream on a specific material/package basis and do not consider the possible recycling method as the guidelines are meant to apply across Europe regardless of the type of recycling technology in place.
- Will guidelines include specific guidance on sorting or collection. Answer: Although sorting isn't a specific component in the guidelines, it is recognised as an important a factor. In Europe more streamlined source-separation is common with flexible plastics collected separately at the curb on some jurisdictions. This improves the bail price for processed materials as it lowers contamination.

Technologies under development:

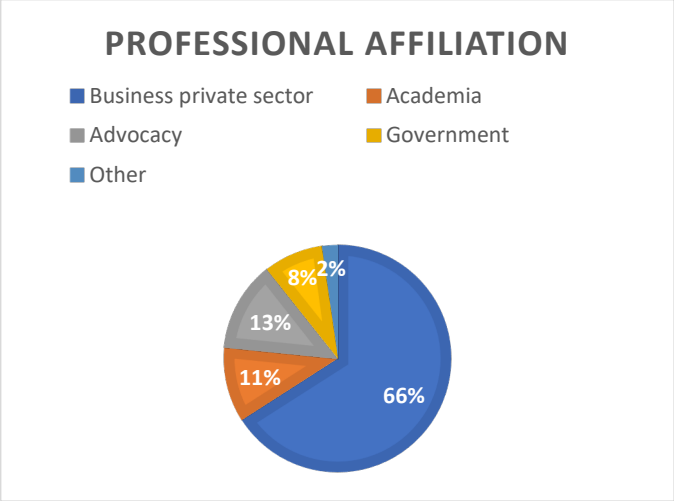
- How to deal with multi-laminates: CEFLEX includes multi-laminates in the design guidelines with direction to re-design the package into a mono-material or compatible polyolefins (PE or PP). Mono-material designs are commonplace across Europe already.
- Technologies already exist to recycle flexible plastic pouches back into flexible pouches, but not food grade at this time due to contamination concerns. Research is underway on decontamination processes although it is not expected to be allowed within the next ten years. With respect to chemical recycling, this could happen sooner as materials are changed at a molecular level. There is not a great deal of involvement from health authorities in this process at this time.
- If a very small amount of metalized PE is included in the package it should not affect the mechanical property of the film, but this is becoming less commonplace in Europe.

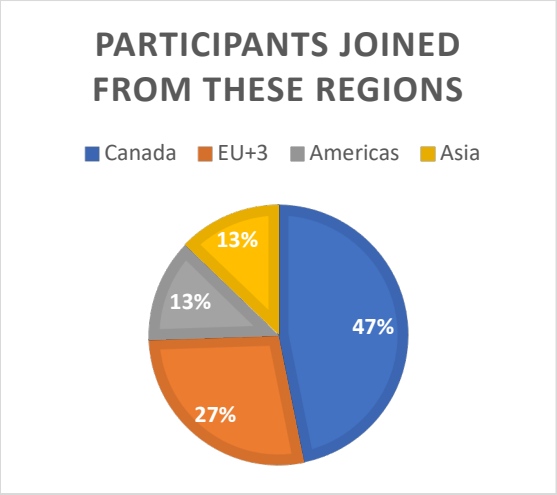
KEY TAKE AWAY MESSAGES

- Flexible plastics offer many benefits due to their light weight, efficient use of materials and have a place in the plastic marketplace in the future.
- Industry is leading collaborative research and developing new technologies to improve the performance characteristics of flexible plastics with post-consumer content and develop new film materials and applications that will improve their recyclability.
- Recycling of flexible plastics is already commonplace in many European countries, and new technologies are continually being developed to improve the design, collection, and sorting infrastructure to address flexibles.
- Design for recycling guidelines have been important to drive changes upstream which in turn enhance downstream efficiencies and opportunities to improve end-products.

EVENT AUDIENCE

47 Attendees	72% Engaged in Q&A and Polls	43% Women	55% Men	2% Prefer not to say





KEY RESOURCES

CEFLEX: ceflex.eu
Design Guidelines for a Circular Economy guidelines.ceflex.eu

Monica Battistella, Taghleef Industries
www.ti-films.com/

Romain Cazenave, Dow Europe
corporate.dow.com/en-us/

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