



**Reaching recycling targets:
The need to use 'difficult-to-recycle' streams...**

...and ways to get there.

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PRS

March 30th, 2017



- 1. European recycling targets versus status**
- 2. Recycling plastic packaging: where do opportunities lie ?**
- 3. Turning opportunities into reality: examples**



2014

Plastic:

Production: 49 million tons

Collection: 25.4 million tons

Recycling: 7.7 million tons,
ie 15.7% of production

Plastic packaging recycling rate: **39.5%** (average)

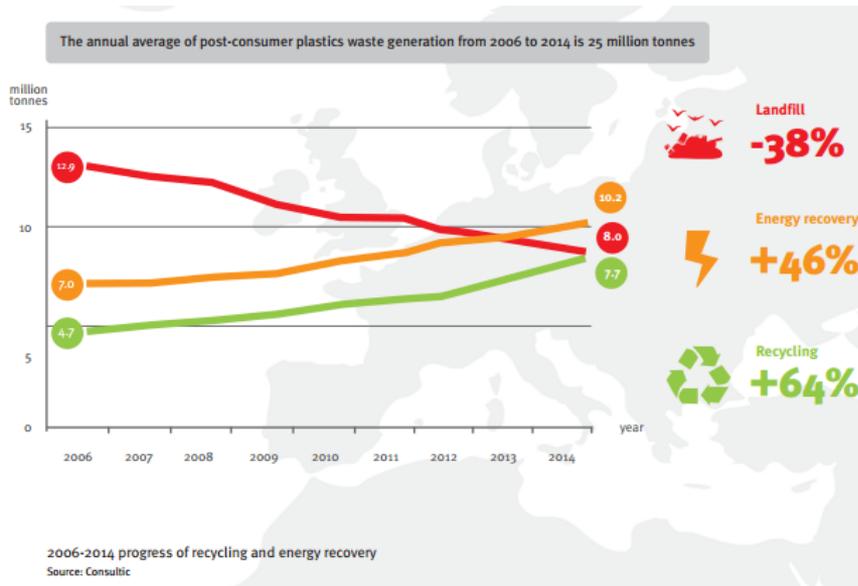


2030

Zero landfilling



Recycling target:
75% of packaging waste.



Recycling rate – status and opportunities

example of France



Figure 27 - Flux des matières plastiques par résine (tonnes) – 2012

Accross all industries



Source: «Analyse de la chaîne de valeur du recyclage des plastiques en France», from Deloitte, for 2ACR, ADEME, Ministère de l'économie, de l'industrie et du numérique

- PET stream well established but 'only' 40% recycling rate:
 - to be improved beyond bottles
- 'Others' almost not exploited today
 - Develop valuable applications (example of multilayer films)

RECYCLING IS THE PREFERRED OPTION FOR PLASTIC PACKAGING



Plastics recycling today works well for packaging which is easy to collect and sort, for example for plastic bottles and commercial packaging films

Recycling technology for plastics is still at an early stage since plastics is the youngest material. In order to realise its full potential, more innovation in plastics recycling technology is needed



From Plastics Europe –The Unknown Life of Plastics – 2016

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Examples:

- **PET thermoforms**
 - **PE contamination in PET stream**
 - **Low viscosity of PET thermoforms**
- **Multilayer films**
- **PVB from laminated glass**

Recycling Thermoformed PET (1/2)

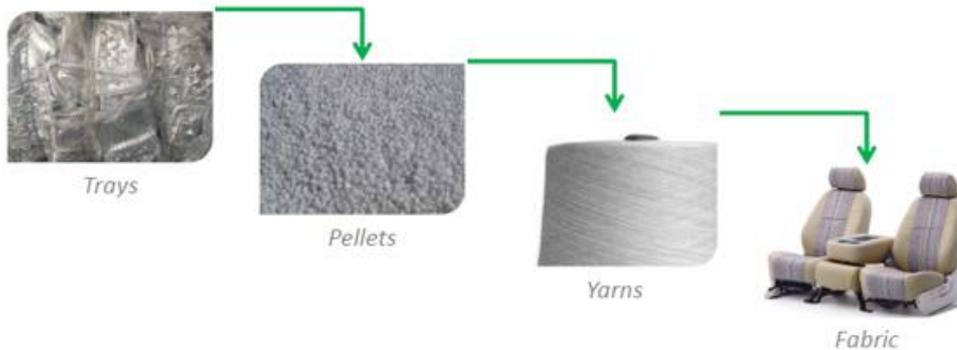


Issue 1: Presence of LDPE contaminant within PET stream

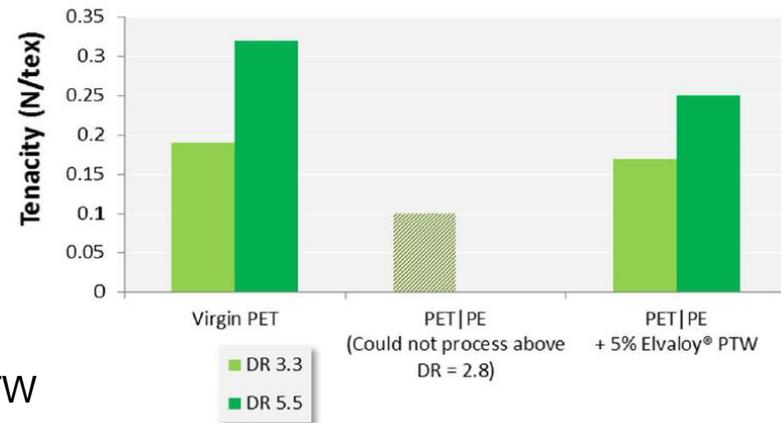
- Large quantities of PET/PE currently unused, or under-exploited (low value applications).
- PET/PE waste made suitable for high performance fibers applications:



Food trays often have an inner layer made of LDPE (5-10 wt%), for sealability to lidding film



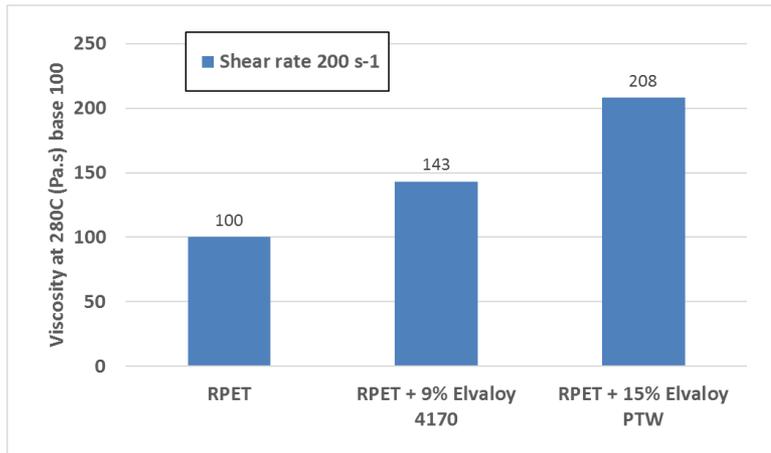
- Study by Centexbel institute, Be
- Addition of [Elvaloy® PTW](#) enables processability of Post Consumer 'PET/PE' waste, even at high draw ratio
- Fibers' tenacity significantly improved thanks to Elvaloy® PTW



- **Without compatibiliser: no stable extrusion process**
- **With compatibiliser: increase in tenacity, in par with virgin PET**

Issue 2: Low viscosity of PET thermoforms

- Flakes from PET trays and trims, is difficult to reprocess due to low viscosity.
- Typically, large percentage of flakes from bottles is needed to reach required viscosity (eg in Cast Sheet process: 70% bottle flakes / 30 % TF flakes).



- Addition of **Elvaloy® terpolymer boosts viscosity** to required levels.
- It enables use of larger percentage of PET thermoforms in recycled blend, for various applications.



Recycling multilayers / multiplastics films (1/2)



The «Virtous Circle» Project:





Dual Compartment Pouch
Multilayer structure: OPET// PE // Surlyn® AD8273




Stiffness
Puncture resistance
Printability

Tight sealing (no leaking)
frangible middle seal: to be open at time of consumption



- ✓ Providing safe meals, even in remote areas
- ✓ Saving resources vs conventional feeding system:
Up to 40% less CO2, 80% less water and, 50% less energy



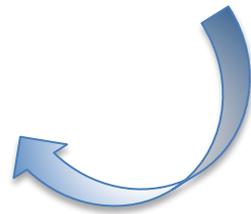


Recycling multilayer films into high quality planks




Multilayer recycle + Saw dust + DuPont compatibilisers

 **WILDLANDS™**
Collects multilayer films



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Learn more at



DÜSSELDORF, GERMANY
04 TO 10 MAY 2017

Find  in the 'Save Food' Pavillon

+ Special presentation: May 8th, 3pm

DuPont
compatibilisers

 **RWPA Solutions**
Rural Waste and Poverty Alleviation



 **WILDLANDS™**

multilayer films

Recycling multilayers / multiplastics films (2/2)



Company: recycler / producer in Poland

Waste source:

Multilayer PE/PA films

Post industrial waste (trims, start up rolls, out of specs)

Recycling quality enhancer:

Fusabond® M603 compatibilizer

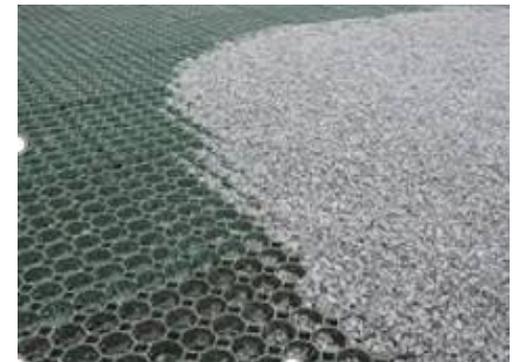
- ensures homogeneity between dissimilar polymers
- stable processing
- good mechanical properties

End application:

Ground reinforcement crates, by Injection Moulding process

Status:

Scale-up phase,
turning commercial in 2017



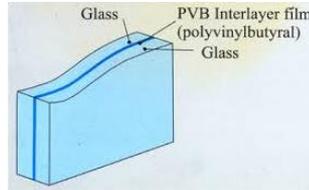
Recycling PVB



PVB used in safety laminated glass
Growing, high value market



Post-use: Separation of
PVB and glass layers
Recycling capability
installed > 20 000t



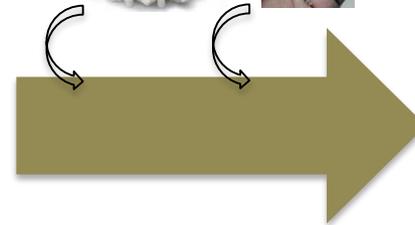
rPVB pellets =
Outstanding polymer
modifier (impact,
plastification...)



Other (recycled)
polymer matrix



Compatibiliser



New applications

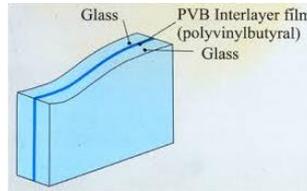


example

PVB used in safety laminated glass
Growing, high value market



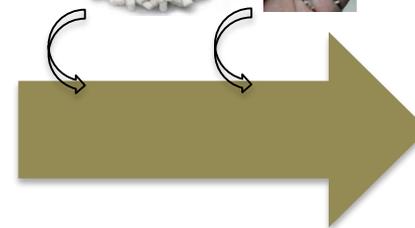
Post-use: Separation of PVB and glass layers
Recycling capability installed > 20 000t



rPVB pellets = Outstanding polymer modifier (impact, plastification...)



Other (recycled) polymer matrix Compatibiliser



New applications



example

Use rPVB as impact modifier for PP

- Compound (recycled) PP with recycled PVB
- PVB acts as an outstanding modifier for improved impact strength of PP matrix
- **Entira™ EP 1754 compatibiliser** is needed (5%) to ensure homogeneity between PP matrix and PVB modifier.
- Examples of commercial applications:



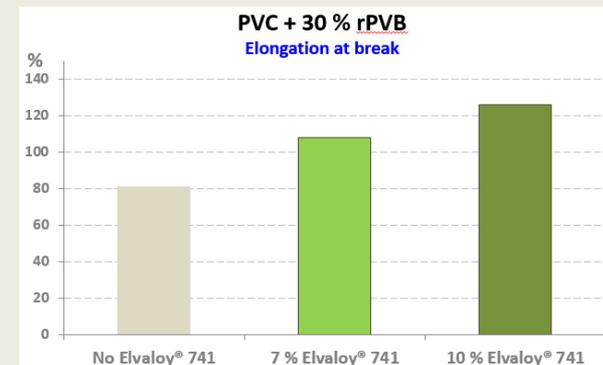
Windshield laminated glass



Auto sound deadening part

Use rPVB as plastifier for PVC flooring

- rPVB is a very **efficient plastifier** for PVC, or rPVC.
- It is non-migrating and **does not contain phthalates**.
- It is very cost efficient compared to standard plasticisers.
- Use of **Elvaloy(R) compatibiliser** (7-10%) ensure homogeneity between PVC matrix and PVB.



Thank you for your attention



Booth D18 at PRS