

A DESIGN FOR CIRCULARITY CASE STUDY: **REPLACING PVC IN TEMPORARY INFORMATION CARRIERS**

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Poly C

INTRODUCTION







PLASTICS TO RESOURCE

Prof. Jo Dewulf

Sustainability Assesment

CONTENT

Introduction of two concepts ⊖Why PVC is an issue in mixed plastic waste Output The case of temporary information carriers Recyclable PP alternatives to PVC for temporary information carriers



<u>CARRIERS</u>

Panels and barriers
Mostly indoor
Short lifetime
Printed
Competitive market









PROPUSAL FUR <u>'RECYCLABLE' (2018)</u>

 \ominus industry proposes own definition of 'recyclable'

⊖Vis-a-vis lack of definition in Plastics Strategy Eaunched by Plastics Recycling Europe

International Plastic Recycling Groups Announce Global Definition of "Plastics **Recyclability**"

Thursday, July 12, 2018 — In an effort to provide a consistent metric to guide the efforts of sustainability for plastics in the Circular Economy, two of the leading global international recycling organizations have developed a global definition governing the use of the term "recyclable" as is relates to plastics packaging and products.

In the joint announcement, Ton Emans, President of Plastics Recycling Europe, and Steve Alexander, President and CEO of The Association of Plastic Recyclers, pointed to the onslaught of recent announcements around commitments to package sustainability and recyclability.

<u>Plastics must meet four conditions for a product to be considered</u> <u>recyclable:</u>

1. The product must be made with a plastic that is collected for recycling, has market value and/or is supported by a legislatively mandated program.



2. The product must be sorted and aggregated into defined streams for recycling processes.

7 The preduct cap be preceded and realized/reaveled with

WHY PVC IS AN ISSUE IN MIXED PLASTIC WASTE

⊖PVC will dechlorinate, leading to HCl ⊖In PVC production, this is countered by using stabilizers ⊖In mixed plastic waste: ⊖Often a 'sink fraction', which is PET-dominated ⊖Overshoot of 100°C on PVC





Fig. 13. Range of processing temperatures for common plastics (Moller and Jeske, 1995).



Typical composition of a postconsumer sink fraction.

THE CASE OF TEMPORARY INFORMATION CARRIERS

Current PVC information carriers are (not allowed in mixed plastic waste and therefore) going into mixed-waste-for-incineration.

Can we replace PVC as a base material by a more sustainable alternative (which is recyclable) that is of equal quality?



CASE LAYOUT

'mono' PP carriers were selected as an alternative, because: ⊖There is a demand for rPP Collection and recycling streams exist for PP (post-industrial) and MPO (post-consumer) ⊖PP is not a problem in mixed plastic waste

Further boundary conditions to be fulfilled: ⊖Equal ease-of-use and printability as PVC Technical proof-of-recyclability required \bigcirc Must be more sustainable (LCA)

Economically competitive





CASE LAYOUT (2)





COMPOSITION

From FTIR and DSC: 'mono' PP isn't quite true... \oplus Both banners (11 m%) and panels (1 m%) are top-coated with PMMA (for printability) What will effect be on quality of recycling?

Densities of 0.950 to 1.050 g/cm³ \ominus Filled with talcum and/or CaC0₃ \Box not expected to inhibit recycling, but affects sorting routes (sink-float)

product	Tradename (supplier)	Thickness	D
		(µm)	
PVC	D-line Frontlit 510	400	l Ir
banner	(Frontlit)		w
PP	Solvent PP Film 220	220	C
banner	(Emblem)		
PVC	FOREX Lite	8000	f
panel	(Thyssenkrupp Plastics)		s
PP panel	Kibo-X	8000	S
	(Infinex)		x





escription

nternal mesh by weaving and covered ith cast PVC

ast film with universal coating

pamed flexible PVC panel with glossy urface

andwich panel: full outer layers with -shaped internal spacer structure

CLOSED LOOP RECYCLING: DE-INKING









AND PROPERTIES







'as is' compression moulding

'as is' extrusion

<u>LCA</u>

 n times (up to 5x) recycling, taking losses into account
 Impact of all treatment steps
 Compare also to cardboard for panels



- 1. Base scenario = PVC, to incineration
- 2. PP base scenario
- 3. Cardboard, n=1 and n=5
- 4. PP closed loop, n=1 and n=5
- 5. PP open loop, 2 options, n=1 and n = 5



USER EXPERIENCE TEST/ ECONOMICS









Users (citizens) do not see the difference



Collected as mixed waste

- (incineration) Collected as mixed plastic
- waste (recycling)
- Collected as paper

<u>CONCLUSIONS OF THE CASE</u>

⊖We can functionally replace PVC by PP as a temporary information carrier Output The PP alternative is cheaper (and on equal footing with) cardboard) ⊖The PP alternative is more sustainable in all scenarios The PP alternative can be recycled \bigcirc Many other 'small plastic waste streams' are also PP \square

create local significant volumes for collection and recycling

as mon









THANK YOU FOR YOUR ATTENTION



ReDESign Recyclable, Sustainable and Functional Information Carriers

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