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Webinar with Delara Burkhardt (MEP, S&D) and the German Environment Agency

How to make packaging more recyclable

Tools for measuring recycling compatibility and recyclability

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Definitions

evaluation method or evaluation standard

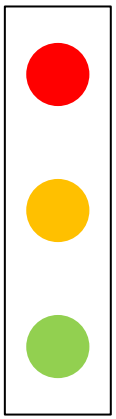
overall heading for catalogues of evaluation rules based on defined rules or test results

We distinguish between

- D4R-guidelines
- D4R-assessments
- Recyclability assessments (RA)

Definitions

D4R-guidelines



checklist of components, material types and other description in which each packaging property (e.g. colour, shape or other relevant features) is **isolated** assigned to its compatibility with a recycling process

(usually in a three-step ordinal scale:
full compatibility, limited compatibility, incompatibility)

Reference for the comparative evaluation is usually an optimally designed packaging (of the same type)

Key objective: Design guide for plastic packaging development

Examples: EPBP-, Recoup-, APR-, Ceflex-, COTREP-Guidelines

Example PET-Bottle

Characterisation (fictitious)

- Material:	PET-A, transparent clear
- Additives:	UV-Stabilisers, AA-Blockers
- Closure-System:	PP-Cap, unfilled
- Liners, Valves:	-
- Direct printing:	Lot number and expiry date
- Sleeve:	Full-sleeve (PO, density < 1g/cm^3)
- Adhesives:	-

Classification according EPBP-Guidelines

- Material:	
- Additives:	
- Closure-Systems:	
- Liners, Valves:	-
- Direct printing:	
- Sleeve:	
- Adhesives:	-
Total score	**?**

Definitions

D4R-assessment

1 x	-3	= -3
3 x	-1	= -3
4 x	0	= 0
Total score=		**-6**

evaluation methods based on guidelines, in which the large number of individual ratings of the guidelines are summarized into one single score (ordinale scale, like a “school grade”)

Since the application is guideline-based, it is limited to the material types for which guidelines exist.

Reference are D4R guidelines and thus the comparative evaluation with an optimally designed packaging (of the same type)

Key objective: Benchmark for packaging development

Example: RecyClass Online-Tool

Example PET-Bottle

Characterisation (fictitious)

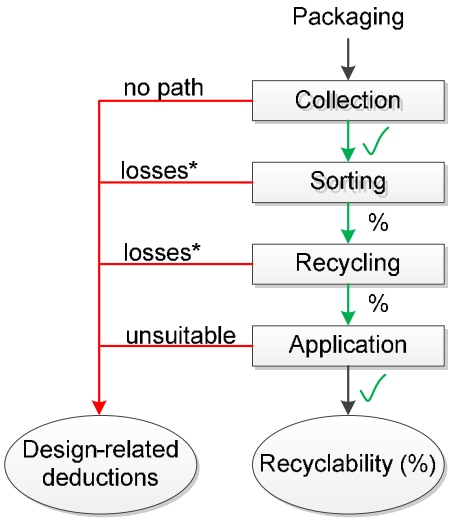
- Material:	PET-A, transparent clear
- Additives:	AA-Blocker
- Closure-System:	PP-Cap, unfilled
- Liners, Valves:	-
- Direct printing:	Lot number and expiry date
- Sleeve:	Full-sleeve (PO, density < 1g/cm^3)
- Adhesives:	-

Classification according (e.g.) EPBP-Guidelines

	Classification Step 1	Classification Step 2	
- Material:	🟢	x 0 =	0
- Additives:	🟡	x (-1) =	(-1)
- Closure-System:	🟢	x 0 =	0
- Liners, Valves:	-		-
- Direct printing:	🟡	x (-1) =	(-1)
- Sleeve:	🟡	x (-1) =	(-1)
- Adhesives:	-		-
		Total score	**(-3) = limited compatibility**

Definitions

Recyclability assessments (RA)



Evaluation procedure that indicates the quantitative recyclability on a metric scale based on a mass balance of the packaging passing through sorting- and recycling-processes considering **recyclate applications**.

RA are descriptive methods. Therefore, they are basically applicable to all types of material. They don't require any D4R-guidelines.

Reference for the simulation is the real (or BAT-) sorting and recycling process **including the recyclate applications.**

Key objective: Manufacturer declaration of conformity about the recyclability of their packaging according to ISO 14021

Examples: DIN EN 13430 | CHI-RA |
many standards for paper-based packaging

Example PET-Bottle

Characterisation (fictitious)		Composition weight	%
- Body:	PET-A, transparent clear, AA-Blocker	26,7 g	89 %
- Closure-System:	PE-Cap, unfilled	2,1 g	7 %
- Liners, Valves:	-		
- Direct printing:	Lot number and expiry date		-
- Sleeve:	Full-sleeve (PO, density < 1g/cm^3)	1,2 g	4 %
- Adhesives:	-		

Evaluation according recyclability assessment
Reference process / application: bottle to bottle (or to film) state of the art process

	Description	Evaluation
Collection:	Nationwide available	✓
Sorting:	Sortable via NIR without restrictions	-
Recycling:	Sleeve can be separated but is not recycled; body is recycled, the cap material is also separated and recycled	+89 % +7 %
Application:	The minor direct printing and the additiv do not prevent the intended application	-
		Total score = balance 96 %

Interim conclusion

When using or adapting standards, please note:

- The diversity of standards results not least from their different function!
- If recyclability is defined as conformity to the requirements of a recycling process, the result of an assessment is predominantly dependent on the recyclate application defined as a reference!

§ 21 packaging law: Ecological modulation of participation fees

(1) **Systems** are obliged to create incentives within the framework of the assessment of the participation fees, to ensure

1. the use of **materials and material combinations that allow the highest percentage possible to be recycled, taking the practice of sorting and recovery into account**

(3) In agreement with the Federal Environment Agency, the Zentrale Stelle publishes **a minimum standard for the assessment of the recyclability of packaging subject to system participation by September 1st of each year, taking into account the individual recycling paths and the respective material type.**

Note!: The minimum standard is a specific Recyclability Assessment and not a D4R-guideline

Some important standards in comparison with the legal requirements on the minimum standard

	EN 13430	CHI-RA	RecyClass online-Tool	D4R-Guidelines (Recoup, COTREP, etc.)	PTS RH 021/97 inter alia
Quantitative measurement (percentage)	✓	✓	✗	✗	✗
Applicability to all packaging material types	✓	✓	✗	✗	✗
References **High quality recycling / recyclate application**	✗	✓	✓	✓	✓
Practice of sorting and recycling (in Germany)	✗	✓	(✓)	(✓)	(✓)
User-friendly (suitable for a large number of different packaging (sales) units)	✗	✗	✓	✓	✗

Example 1: Plastic tube of PP, filled tube laminate

Composition:

Tube laminate (PP-EVOH-PP)	
PP (filler content 40 %)	33 %
EVOH – tie layer	5 %
PP-shoulder / head	19 %
Cap (PP)	42 %
Printing, lacker	1 %

Recyclability Assessment according minimum standard

Reference process & application in practice	PP-stream / PP-injection moulding or trays	
Basic score = valuable material content	PP-content	94 %
Path	Nationwide collection and sorting in PP-stream	✓
Sortability	Detectable and sortable via NIR	± 0 %
Separation (grinded material)	Loss of the laminate because of density >1g/cm^3	- 33 %
Incompatibilities / reference application PP-injection moulding or trays	None	✓
Total score = available valuable material content = Recyclability		**61 %**

Example 2: Plastic tube of PP, minor filled tube laminate

Composition:

Tube laminate (PP-EVOH-PP)	
PP filler content 8 %	33 %
EVOH, tie layer	5 %
PP-shoulder/head	19 %
Cap (PP)	42 %
Printing, lacker	1 %

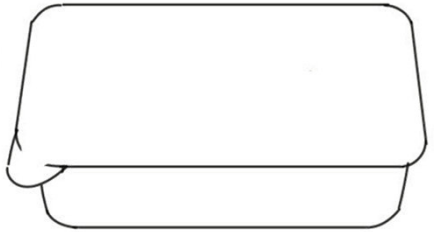
Recyclability Assessment according minimum standard

Reference application in practice	PP-injection moulding or trays	
Basic score = valuable material content	PP-content	94 %
Path	Nationwide collection and sorting in PP-stream	✓
Sortability	Detectable and sortable via NIR	± 0 %
Separation (grinded material)	Loss of PP because of density >1g/cm^3	± 0 %
Incompatibilities / reference application PP-injection moulding or trays	None	✓
Total score = available valuable material content = Recyclability		**94 %**

Example 3: Paper-based Trays

Composition:

Multilayer cartboard, kraft paper	80 %
Adhesives	5 %
Plastic coating	14 %
Lacquers	1 %



Recyclability Assessment according minimum standard

Reference process & application in practice	Paper composite stream / corrugated based paper	
Basic score = valuable material content	Fiber content	80 %
Path	Nationwide collection and sorting in the paper composite stream	✓
Sortability	Detectable as paper only from one side	-40 %
Separation (repulpability)	Low defibration (60 %) in practice due to wet strength design	-16 %
Incompatibilities	High stickyness	✗
Total score = available valuable material content = Recyclability		**0 %**

Example 4: Liquor bottle, black lacquered

Composition:

Bottle, soda-lime-glass	95 %
Plastic closure	3 %
Lacquering, direct printing	1,5 %
Tamper-proof seal	0,5 %

Recyclability Assessment according minimum standard

Reference process application in practice	Container glass	
Basic score = valuable material content	Glass content	95 %
Path	Nationwide collection and waste glass processing	✓
Sortability Separation	Not detectable in the optical (transmitted light measurement)	- 95 %
Incompatibilities	None	± 0 %
Total score = available valuable material content = Recyclability		**0 %**

Conclusion

The function of standards to measure recyclability is to set the benchmarks for the development of ecologically optimized packaging design.

However, the function of standards is not to be understood in a one-sided way; they must be used as a functional dynamic tool to bring packaging design and recycling technology closer together!

Contact details

Thank you for your attention!

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