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Recycling materials requirements for the circular economy

Conference | Sustainability
of Products
by TÜV Rheinland

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We live in a fast-changing world,

... , European Ecodesign for Sustainable Products Regulation (ESPR) will have a significant impact on the future markets for consumer and commercial products design and the circular economy.

New and challenging regulations both domestic and abroad. Staying ahead and assuring compliance is more challenging than ever for manufacturers, suppliers and brands.

- **Legislative and regulatory efforts addressing recycling and recyclability** have increased significantly and relatively quickly at an international level.
- The EU Green Deal impacts products and productions
- **Upcoming chemical restrictions** expected in the EU and US
- **Global implementation of the POPs legislation** – restriction of PFAS

Recycling materials requirements for the circular economy

Recycling materials requirements for the circular economy

Aim of the ESPR is to promote the production and consumption of sustainable products that are efficient in use, last longer, are based on recycled materials rather than primary raw materials, and are marketed using circular business models.

In a circular economy, secondary materials are valuable materials and not waste.

Circular economy requires quality-assured recycling

The European WFD defines criteria, the fulfillment of which allows a waste to be released from the waste regime under the producer's own responsibility:

- Material is intended for a specific purpose;
- There is a market or demand for the substance or object;
- Meets the technical requirements for the intended use and complies with legislations and product standards;
- Use of the material or product does not result in overall adverse effects on the environment or health.

Available standards for recycling, marking and traceability

Recycling materials requirements for the circular economy

Recyclability of a product means that it can be

- collected,
- separated,
- otherwise recovered from the waste stream for reuse or
- use in manufacturing or assembling another item.

... is an important component of this and must already be taken into account during development.

- Existing sorting and recycling infrastructure for the respective product → ensuring high-quality mechanical recycling.
- **Products/Materials must be designed** in such a way that it is **sortable** in terms of the proportion
- **Recycling incompatibilities are to be excluded** so that the recycling process cannot be disrupted and recycling success is guaranteed in practice

Existing Standards

EN 15343 „**Traceability**“

Proof of the quality of the regranulate

- EN 15342: Polystyrene (PS)
- EN 15344: Polyethylene (PE)
- EN 15345: Polypropylene (PP)
- EN 15346: Polyvinyl chloride (PVC)
- EN 15347: Plastic waste
- EN 15348: Polyethylene terephthalate (PVC)

EN 45555 „**Recyclability**“

DIN EN ISO 14021 “Environmental claims”

ISO 11469 “**Markings**”

...

...



Material cycles need to be closed through recycling and reuse of recycled materials to move towards the ideal of a circular economy. Upcycling, Recycling and Downcycling have become part of our language and industry, but their meanings are not always clear.

Recycling



Upcycling



Downcycling



Recycled plastic intended to come into contact with foods

Recycling materials requirements for the circular economy on plastics

EU Commission adopted in 2018 a strategy for plastics in a circular economy to **increase recycled content in packaging**.

Food packaging holds a large proportion of plastic packaging, therefore the policy can only achieve its objectives if also the recycled plastic content in food packaging increases.

Safety and **quality of recycled plastic materials** and articles, rules are laid down in **Regulation (EU) 2022/1616**.

Key aspects

Individual batches of recycled plastic and of recycled plastic materials and articles must be accompanied by

- A single document or **record regarding their quality**,
- Including a **declaration of compliance** (DoC),
- **Instructions** to the converters and final users **regarding its use**,
- Shall be identified by a **unique number** and the name of the manufacturing stage from which they originate.



Recycled plastic intended to come into contact with foods

Recycling materials requirements for the circular economy on plastics

Recycling facilities are complex. Installations and operation depend on many parameters and procedures.

Decontamination facility must have

- documents that summarize the operation,
- **control** and **monitoring** of this facility and
- the **recycling facility** to which it belongs in a standardized form **such that compliance with this Regulation is demonstrated.**

.. compliance monitoring by the recyclers themselves and **efficient audits** as part of official inspections.

Business operators shall reflect the following points

- DoC are different from FCM law,
- DoC does not contain details about substances, which are subject to limitations
- Migration tests need to be executed in a sensible way.
- Test should include all common monomers and additives for the specific material, and
- NIAS testing should be considered.
- More available once the guidance document is public

TÜV Rheinland Group – Customer Information
Business Stream Products

Recycled Food Contact Materials Regulation (EU) 2022/1616.

TÜV Rheinland LGA Products - Information October 2022

On 20 September 2022, the European Commission released [Regulation \(EU\) 2022/1616](#) of 15 September 2022 on recycled plastic materials and articles intended to come into contact with food. The Regulation enters into force on 10 October 2022 and repeals Regulation (EC) No 282/2008. As part of the 2015 circular economy action plan, the Commission identified the increase in plastic recycling as an essential prerequisite for the transition to a circular economy.

The Commission therefore adopted in 2018 a strategy for plastics in a circular economy. It strives to increase recycled content in packaging. Food packaging holds a large proportion of plastic packaging, therefore the policy can only achieve its objectives if also the recycled plastic content in food packaging increases. In order to ensure the safety and quality of recycled plastic materials and articles, rules on the placing on the market of those products are laid down in Regulation (EU) 2022/1616.

RECYCLING TECHNOLOGIES AND PROCESSES

One of the key points in Regulation (EU) 2022/1616 is to define requirements for the development and operation of recycling technologies, recycling processes and recycling equipment for the production of plastic for use in food contact materials and articles (FCMs). Annex I contains suitable recycling technologies that have proven to be safe. However, rules are also laid down to ensure that recycled plastic FCMs produced with novel technologies (any new recycling technology that is not yet reviewed regarding its suitability for FCMs) are of minimal risk placing such materials and articles on the market can be used to collect the information and experience allowing for the evaluation of the technology. Therefore, prior to the placing on the market of these recycled material and articles, all available information on the principles, concepts and practices used by the novel technology should be used to minimize risks, and data on the decontamination efficiency of the technology must be available. Moreover, reports on the safety of the materials and of such monitoring are to be made public following the rules in Article 20.

RECYCLING INSTALLATION: COMPLIANCE MONITORING

Since recycling installations are complex and they may be subject to many parameters, it is appropriate, in order to facilitate compliance monitoring by the recyclers and audits as part of official controls, to require that recyclers operating a decontamination installation keep available a document called 'Compliance Monitoring Summary Sheet' (CMSS). This CMSS summarizes the operation, control and monitoring of that installation as well as of the recycling installation of which it is part in a way that shows compliance with Regulation (EU) 2022/1616. This document can be found in Article 26 and Annex II.

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Precisely Right.



Electrical and Electronic Equipment (EEE)

Electrical and Electronic Equipment (EEE)

Recycling materials requirements for the circular economy

Material requirements for plastics used in electrical and electronic equipment include, largely irrespective of whether they are primary plastics or PCR:

- **Odor**
- **Aesthetic requirements**, e.g. color, gloss, and yellowing index.
- **Recycled content**, specified as % and PCR (**Post-Consumer Recyclate**) or PIR (**Post-Industrial Recyclate**) content
- **Chemical requirement** - RoHS, REACH and POP
- **Physical requirements** - density, adhesion strength
- **Mechanical requirements** - tensile modulus and strength, tensile elongation, etc.
- **Thermal requirements** - softening temperature or melting temperature.
- **Flame resistance**, according to UL 94 or ASTM D 3874.
- **Purity** and **chemical properties**, e.g., filler content, bromine content, impurities.
- ... **UV stability** (ban on certain UV-stabilizer)

Substances of Concern (Requirement for Hazardous chemicals)

Recycling materials requirements for the circular economy

Since recycling by its nature involves working with very **heterogeneous material** returned from the market, **pollutants play a special role**: substances that are now strictly regulated will still be present **in the waste stream** for a long time.

While it is relatively easy to avoid using regulated substances in primary materials, the recycler's task is to **separate out the contaminants** that are already present (WFD – SCIP Database).

As no separation process is 100% efficient, undesirable substances will inevitably be introduced into the recycle stream:

- *DecaBDE is a commonly used flame retardant found in WEEE such as TV, computer and laptop casings, cables and plugs.*
- *Mineral oil for printing inks – MOSH/MOAH in packaging materials*

Directive 2012/19/EU on waste electrical and electronic equipment

→ Goal: **Reduction of the share of discarded appliances in waste**

→ Proper disposal and recycling of raw materials

Directive 2011/65/EU on the restriction of the use of certain in electrical and electronic equipment (ROHS) **hazardous substances**

Regulation (EU) 2019/1021 on persistent organic pollutants

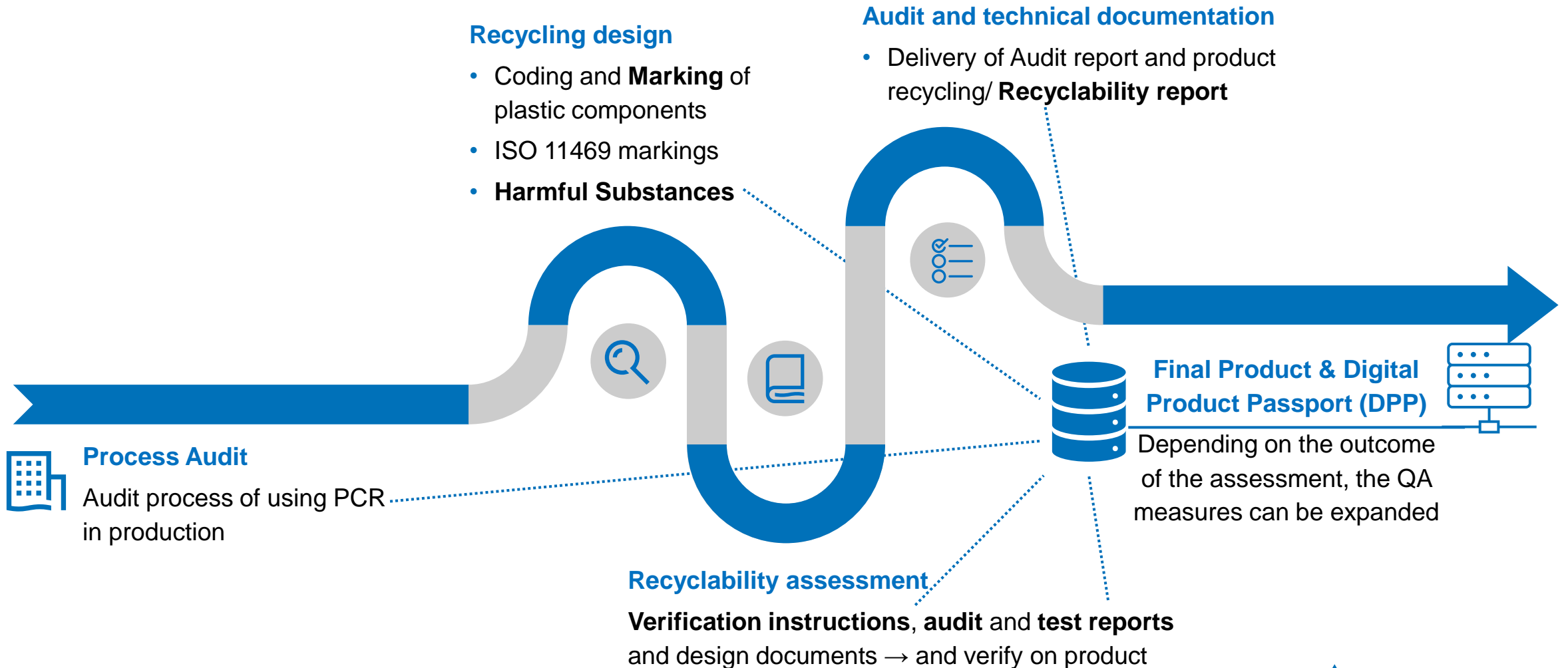
→ Goal: **Reduction of the use of hazardous substances** already during the production of the devices.

EU Framework Regulation

Regulation (EC) No 1907/2006 - Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

Process chain and Information obligations

Recycling materials requirements for the circular economy - Transparency





Toys and Childcare Products (Made of Polyester)

Polyester is a synthetic polymer that is very easy to recycle, if it is available in large quantities, sorted by type and with only minor contamination (exclusion of materials from household waste stream).

Mechanical recycling

Plastic is melted to make new yarn. This process can only be done a few times before the fiber loses its quality.

Chemical recycling

involves breaking down the plastic molecules and reforming them into yarn.

Identification of recycled polyester (rPET)

Recycling materials requirements for the circular economy

Many manufacturers and retailers **promote** this **recycled polyester (rPET) as environmentally friendly** and sustainable, since using recycled polyester from melted down and spun PET bottles uses fewer resources than producing new fibers.

rPET is just as good as virgin polyester and **requires fewer resources**

Recycled polyester is almost equal in quality to newly produced polyester, but its production **requires 50% less energy than virgin material.**

However, it should be noted that the use of this material is "downcycling," as the PET material is removed from the stream and is no longer primarily used to make new drinking bottles or food packaging.

Due to the **increasing global demand for recycled polyester** from the food packaging industry (the mandatory use of **recycled polyester in beverage bottles is growing** due to implementation of Single Use Plastic Directives) and from apparels manufacturers, significantly higher and further increasing prices are demanded for the recycled material than for so called "virgin" PET.

Against this background, it is logical to check whether the material offered or used is actually a containing the declared amount of recycled polyester.

Conclusions

Recycling materials requirements for the circular economy

Coordinated recycled material use rates to avoid cannibalization of functioning recycling streams.

Reliable and verifiable standards, means

- Clear classification of plastic waste according to material flow and degree of recycling (post-consumer, post-industrial/pre-consumer, post-commercial, etc.)
- (minimum) qualities depending on the intended use of the recyclate
- Labeling of the recycled content and type of recyclate
- Handling of plastic waste and recyclates (collection, sampling, processing, etc.)

Documentation & Information

- Reports on verified Recycle design, Recyclability and Harmful Substances form a part of the sustainable product performance and belong to the DPP



Thank you very much
for your attention

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