

Eco-design of adhesive tapes: Towards circularity

The proposed categorisation system for the circular economy published by the European Commission highlights the **9R's approach** and lists 14 **circular categories**, which are classified under 4 main groups listed below:

- Circular design and production models
- Circular use models
- Circular value recovery models
- Circular support

The document defines categories of activities substantially contributing to the circular economy objective, either by **increasing resource efficiency** or **decreasing environmental impact** across the value chain.¹

The 9 circular economy 'R' strategies or principles		
R1	Refuse	Make the product redundant by abandoning its function or by offering the same function by a radically different (e.g., digital) product or service
R2	Rethink	Make product use more intensive (e.g., through product-as-a-service, reuse and sharing models, or by putting multi-functional products on the market)
R3	Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials
R4	Re-use	Re-use of a product that is still in good condition and fulfils its original function (and is not wasted) for the same purpose for which it was conceived
R5	Repair	Repair and maintenance of defective products so they can be used with their original function
R6	Refurbish	Restore an old product and bring it up to date (to a specified quality level)
R7	Remanufacture	Use parts of a discarded product in a new product with the same function (and as-new-condition)
R8	Repurpose	Use a redundant product or its parts in a new product with a different function
R9	Recycle	Recover materials from waste to be reprocessed into new products, materials, or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations

Source: [Categorisation system for the circular economy](#)

How do adhesive tapes support the ‘R’ strategies?

At Afera’s Annual Conference 2022, **Prof. Dr. Andreas Groß**, Head of Workforce Training and Technology Transfer at **Fraunhofer IFAM** shared an interesting presentation that provided a comprehensive answer to this question.

His talk highlighted ‘**controlled longevity**’ – that combines **product safety requirements** with the requirements of **circular economy** and **eco-balance effectiveness** – as a solution approach to secure and expand the application areas for adhesive bonding technology, in which adhesive tapes play an important role.

The following table provides a snapshot of how adhesive tape bonding technology contributes to the 9R’s approach.

‘R’ Strategies	Guiding Principle	Contribution of Adhesive Tapes
R1 – refuse R2 – rethink R3 – reduce	Smarter product use and production to reduce the raw material use	Tapes contribute by: Improving product longevity (R2) Enabling lightweight design (R3) Key market segments supported: Automotive and Transport, Renewable energy, etc.
R4 – re-use R5 – repair R6 – refurbish R7 – remanufacture R8 – repurpose	Extending the life of the product and its parts to keep the raw materials within the economic system	Tapes are commonly used for the repair of products to extend their service life Key market segments supported: Footwear, Automotive and Transport, Electronics, Household appliances, etc.
R9 – recycle	Useful application of materials to extract secondary raw materials to reduce the use of primary raw materials	Through strategies such as targeted debonding, use of secondary raw materials, and design for recycling, tapes can support circularity.

Contribution of adhesive/tape bonding technology with regard to the ‘R’ strategies

Source: Prof. Dr. Andreas Groß, Fraunhofer IFAM (Bremen)

Circular design: Material innovation and substitution

Through a series of sustainability stories, we’ll take a closer look at how the **adhesive tapes industry** is progressing within each of the circular category groups. And in the first part of this series, the focus is **on circular design (raw material innovation and substitution)**.

Circular category groups		
Circular design and production	- Design innovation	Interventions take place early in the product lifecycle
	- Process innovation and reengineering and/or	
	- Material innovation and substitution	
Circular use	- Product and asset lifecycle extension based on reuse, repair, repurposing, refurbishment, or remanufacturing strategies and/or - Product and asset use-optimizing leasing and sharing models	Interventions typically take place during or at the end of the use phase of products and assets
Circular value recovery	Recovery of wastes in preparation for reuse and recycling or other circular economy strategies	Interventions typically take place during the after-use phase of products and assets
Circular support	Development/deployment of tools, applications, and services	Applicable across the product lifecycle

Source: [Categorisation system for the circular economy](#)

Amongst the many strategies to advance the **eco-design of adhesive tapes**, the industry is focusing on the following key approaches:

- Reducing the overall use of raw materials while maintaining performance
- Adopting design for recycling guidelines
- Incorporation of renewable bio-based content
- Replacing virgin materials with secondary raw materials

In particular, the use of **secondary raw materials (recycled content) in tapes** has grown recently in response to growing regulatory pressures.

Incorporating recycled content in tapes: Commercial examples

The packaging sector, an important market for adhesive tapes, is currently under pressure to comply with mandatory targets requiring the inclusion of minimum recycled content. The tapes industry has responded with several product launches in recent years that feature both post-industrial and post-consumer recycled content.

Company	Product	Recycled content
monta	Self-adhesive tape	Filmic backing made with ≥99% post-industrial recycled PP
tesa	PET packaging tape	Backing made with 70% post-consumer recycled PET

Southgate Global	PET tape for cardboard boxes	Made with 85% recycled plastic
Essentra Tapes	PET tape for flexible packaging applications	Made with PET film containing 70% post-consumer recycled content
Irplast	Pressure-sensitive adhesive tape	Made of 34% post-industrial recycled Irplast BOPP film Cores made from recycled cardboard
PPM	Duct tape	Backing made with 60% post-industrial recycled low-density polyethylene
	Packaging tape	Made with 30% recycled fibres

Substitution of virgin materials with secondary raw materials in adhesive tapes

In addition to these examples, the adhesive tapes industry is working on other design advances, which represent the industry’s commitment to a sustainable and circular future. Going forward, we will explore them through more such sustainability stories. Watch this space for more!

¹European Commission, Directorate-General for Research and Innovation, Schempp, C., Hirsch, P., Categorisation system for the circular economy: a sector-agnostic categorisation system for activities substantially contributing to the circular economy, Publications Office, 2020, <https://data.europa.eu/doi/10.2777/172128>