CLOSING THE LOOP IN PRACTICE:

IMPLEMENTING THE RESCOM
METHODOLOGY AND FRAMEWORK

ResCoM

A circular economy is one that is restorative and regenerative by design, and aims to keep products, components, and materials at their highest value at all times. It is a systemic approach to the economy designed to benefit businesses, society, and the environment. Companies are increasingly tapping into its opportunities by designing business models that generate value from reuse, remanufacturing, leasing, and design for multiple lifecycles. However, there are very few tools to support manufacturers in adopting such a systemic approach. The ResCoM (Resource Conservative Manufacturing) project has developed a methodology and the first practical tools of their kind to help fill this gap. Together they support manufacturers in developing products that fit a circular economy. By assessing the economic and environmental performance of circular economy business models, and integrating product design considerations, the tools enable manufacturers to move beyond idea generation and onto implementation.

The methodology and tools are complemented by a series of industrial case studies that have demonstrated their application across various industries. Four original equipment manufacturers (OEMs) - Bugaboo, Gorenje, Loewe, and tedrive - used the ResCoM methodology and tools to implement closed-loop product systems in their industries. Lessons learned from these pilots also fed into the creation of guidelines to support other companies when implementing the ResCoM methodology.

This document describes the ResCoM tools, along with the guidelines for the implementation of the ResCoM methodology in three distinct areas:

- **Best practices for developing and testing products for a circular economy.** Best practices to support manufacturers in designing, piloting, and scaling new circular economy business models, based on the learnings of the four ResCoM industrial case studies
- **Design methodology.** A stepwise approach for applying the ResCoM design methodology to the development of multiple lifecycle products, along with recommendations for the ResCoM tools to address specific challenges during the process
- **Implementation of the ResCoM framework.** A set of requirements to consider based on the four ResCoM pillars (business model, product design, supply chain, and technology) during transition phase towards the development of circular economy products and business models.

The full project outcomes, including the ResCoM methodology and tools, and the supporting industrial case studies are available on the ResCoM website (www.rescoms.eu).

The ResCoM project consisted of twelve organisations across research, industry and technology.

KNOWLEDGE PROVIDERS

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THE RESCOM PLATFORM AND TOOLS CAN BE ACCESSED ONLINE AT:

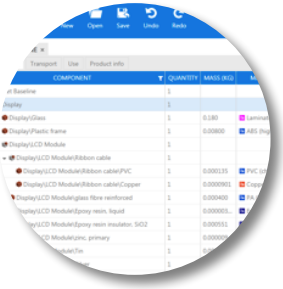
www.rescoms.eu

CIRCULARITY CALCULATOR

Quickly compare the potential of different circular design strategies

CIRCULAR PATHFINDER

Identify promising circular design strategies

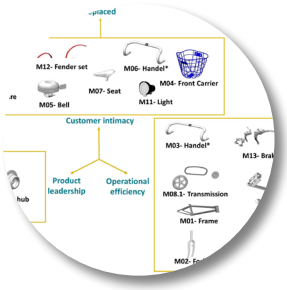


MI:BOM ANALYZER (ECO AUDIT REPORTS)

Compare environmental, regulatory, and supply chain risks of circular scenarios

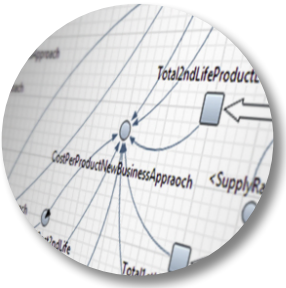
LEASE OR BUY - RESCOM SERIOUS GAME

Experience the outcome of different circular business models in a game setting



MULTIPLE LIFECYCLE PRODUCT DESIGN

Determine and standardise module interfaces for easy upgrade or replacement



MULTIMETHOD SIMULATION

Compare economic and environmental performance of circular product systems

PART PLANNING

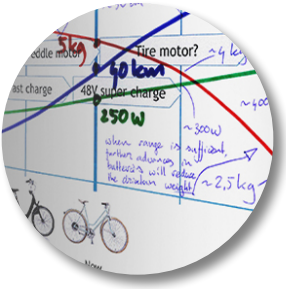
Identify needs for part durability and repair

MULTIPLE PRODUCT LIFECYCLE MANAGEMENT

Manage and trace product information

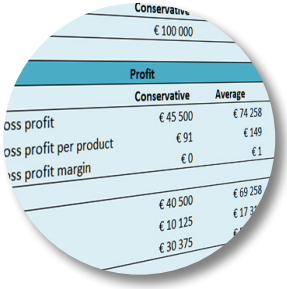
REMAN DESIGN CHECKLIST

Identify how to optimise products for remanufacturing



UPGRADE FORECAST

Create products adaptable to future needs



ANALYTICAL TOOL

Compare potential profitability and environmental performance

Best practices for developing and testing products for a circular economy

GET STARTED

- State your ambition
- Align top-management
- Work as an incubator
- Explore ResCoM tools
- Set-up a multi-disciplinary team
- Plan and request budget for iterations

DESIGN

- Create different virtual models using ResCoM tools
- Consult circular economy experts
- Select one or two models to pilot
- Engage supply chain and service engineers

GORENJE

'Our company learned a lot from the ResCoM project and the provided tools, and are now piloting our multi-lifecycle leasing scheme.'

GORENJE

'We suggest to start with virtual models and theoretical background.'

LOEWE

'Start the design phase finding and calculating new business models.'

TEDRIVE

'We underestimated the required resources, we should have better analysed that upfront.'

BUGABOO

'It helps to involve team members from all departments, who are ready to challenge the status-quo.'

BUGABOO

'Using ResCoM tools we discovered opportunities that we could implement straight away, such as increased re-cycled and recyclable content and ways to extend lifetime.'

The ResCoM deliverable 'D6.6 Generic guidelines for scaling up the ResCoM framework and platform' can be accessed online at www.rescoms.eu/project/deliverables.

PILOT

- Align iterative approach and go/no-go criteria upfront
- Test all aspects of the business model
- Plan for multiple pilot or design loops
- Aim for new markets and additional returns instead of percentual profitability

BUGABOO

'You need multiple loops in your pilot to allow for improvements before you can judge the success of your business model.'

GORENJE

'The pilot, using remanufactured components, showed us new challenges with proof of quality and consumer acceptance.'

SCALE

- Embed your test protocol in third party certification
- Ensure PLM traceability of products and parts
- Collaborate with partners specialised in new capabilities e.g. leasing and reverse logistics
- Scale region by region, and product by product
- Communicate your success stories

LOEWE

'For companywide implementation of circular business models we will set training cycles, internally and at external partners.'

BUGABOO

'We are considering involving external partners to handle the service, so we can focus on what we are good at; developing great products to last.'

The ResCoM design methodology

PROJECT PHASE	DESCRIPTION
Project definition	In this stage, the activities are focused on discovering opportunities and generating new product ideas. This stage also includes a quick assessment of the (technical) merits of the project and its market prospects.
Concept definition	In this stage, the product idea is defined in more detail, usually complemented with an assessment of the technical, market, and business feasibility of the product.
Design definition	The product concept is designed and developed in detail, including the development of manufacturing and marketing plans. Extensive testing and validation (e.g. customer acceptance) also takes place in this stage.
Product implementation	This stage marks the launch of the product and the beginning of full production and commercialisation.

The complete ResCoM deliverable 'D3.4 Report on generic ResCoM design methodology' can be accessed online at www.rescoms.eu/project/deliverables.

APPROACH	RESCOM TOOLS
STEP 1: State your project ambitions	
STEP 2: Identify circular product design strategies	• Circular Pathfinder
STEP 3: Determine circularity potential of your strategy	• Circularity Calculator • Analytical Tool
STEP 4: Visualise your circular strategy	
STEP 5: Design product	• Part Planning • Upgrade Forecast • Reman Design Checklist • Multiple Lifecycle Product Design
STEP 6: Track performance	• Circularity Calculator • MI:BoM Analyzer • Analytical Tool • Multimethod Simulation
STEP 7: Detail design	• Part Planning • Upgrade Forecast • Reman Design Checklist • Multiple Lifecycle Product Design • Circularity Calculator • MI:BoM Analyzer • Analytical Tool • Multimethod Simulation
STEP 8: Implement	• Multiple Product Lifecycle Management

Implementing the ResCoM framework

design

Determine the design requirements for closing the loop by considering:

- **Product attachment and trust.** Create products that will be loved, liked or trusted longer
- **Reliability and durability.** Develop reliable products that can take wear and tear
- **Ease of maintenance and repair.** Enable products to be maintained in good condition
- **Standardisation and compatibility.** Create products with parts that also fit other products
- **Upgradability and adaptability.** Allow for future expansion and modification
- **Dis- and reassembly.** Ensure product parts can be separated and reassembled easily
- **Recycling and biodegradability.** Ensure the product and/or its components separate into recyclable and/or biodegradable fractions

Determine the supply chain requirements needed to fulfill the chosen combination of business model and design strategy. Some example considerations include:

- **Product collection.** Should competitors products also be collected from the market?
- **Incentives.** Should an incentive to return be offered?
- **Repair capabilities.** Should some work be outsourced to third parties?
- **Collection model.** Should a centralised or decentralised model be used?

supply chain

The complete ResCoM deliverable 'D2.4 Guidelines for the generic implementation of the ResCoM framework' can be accessed online at www.rescoms.eu/project/deliverables.

Determine the business requirements for closed-loop product systems by considering the following questions:

- **Value proposition.** What value is provided and to whom?
- **Value creation and delivery.** How is value provided?
- **Value capture.** How does the company make money and capture other forms of value?
- **Market for multiple use cycle/lifecycle products.** What is the market potential?
- **Product acquisition to close the loop.** How do you economically get products back after use?

Technology can support interactions between the other ResCoM pillars of design, business models, and supply chain.

The ResCoM collaborative software platform integrates the methodology and tools developed by the ResCoM project. It includes data models and product multiple lifecycle management of product-related information - including the product requirements, bill of materials and product design - as well as access control to protect data.

Visit the website to access the ResCoM platform,
tools, and the final project deliverables.

www.rescoms.eu

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