JOINT SUCCESS STORY

Pro²Future :: Products and Production Systems of the Future

ACDP :: Austrian Center for Digital Production

Programme: COMET – Competence Centres for Excellent Technologies

Programme line: COMET-Centre K1

Type of project: Common Research Programme II (CRP II), Sustainable Products and Production, 4 Years

CLOSING PACKAGING LOOPS TO GENERATE ECONOMIC AND ECOLOGICAL ADDED VALUE

SUSTAINABLE MATERIALS AND RECYCLABLE PACKAGING SYSTEMS ARE ALREADY BEING USED IN MANY AREAS. IN AN INDUSTRIAL CONTEXT SUCH CONSIDERATIONS ARE STILL RARE. THIS PROJECT AIMS TO CHANGE THIS AND CONTRIBUTE TO A RETHINK.

For a long time, little attention was paid to the packaging of industrial products, and **ecological optimization** was not a primary focus. Consequently, there is **significant potential** for greening and economizing the supply chains of numerous industrial companies in this area.

A **joint project** involving the COMET Centres CDP and Pro²Future, the universities TU Graz and WU Vienna, as well as the company EVVA Sicherheitstechnologie GmbH, addressed this potential and posed the research question of the extent to which the **conversion of product packaging** from plastic to other materials, such as cardboard, and the recycling of packaging (i.e., production, delivery, return, reuse, etc.) offer **economic and ecological added value**.

To answer the research question, a **simulation model** was developed to **assess the impact** of packaging recycling in terms of **costs and emissions** before implementation and to compare it with the current situation. After selecting a suitable modelling approach and simulation tool, a **multi-method simulation** approach was chosen (a combination of **agent-based** simulation and **discrete-event** simulation). Following the model's development, the existing industry data was experimentally analysed. The interactions between packaging procurement, use, and return were analysed and presented as a function of customer orders and order rates. The industry data and information used for the simulation study were provided by the industry partner (e.g., packaging variants and materials, packaging weight and costs, customer addresses and demand, means of transport and transport volumes, etc.).

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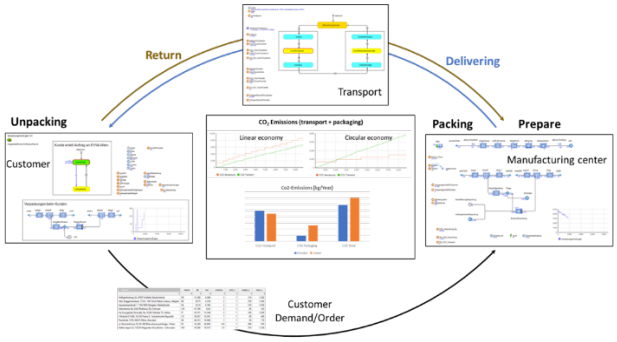

The **emission values** from transport and the packaging materials used were sourced from relevant sources (e.g., European Environment Agency, Institute for Energy and Environmental Research Heidelberg, etc.). The data were collected, analysed, and processed, then integrated into the simulation model before refining and parameterizing the model in more detail.

This simulation model was structured to be easily extended. New customers, their demand, and their transport rates can be imported via Excel tables. Additionally, the packaging materials and products used, as well as the emissions they contain, can be changed at any time. With the help of this tool, it is **possible to make strategic decisions to optimize the resource efficiency** of packaging in an industrial environment.

Impact and Effects

The results of this study contribute to a more nuanced understanding of **sustainable packaging** practices and provide valuable insights for businesses and stakeholders engaged in **environmental responsibility**. The economic benefits, coupled with positive environmental contributions and **improved transport efficiency**, make reusable packaging a **strategic decision** that aligns with both **financial objectives** and **ecological responsibility**. This case study offers **valuable insights** for companies seeking to make informed decisions about packaging methods and transportation practices, striving to strike a balance between environmental responsibility and economic considerations.

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