

Summary for the final report

Functional & recyclable coated paper packaging for food products (Repac²)

Motivation and goals In the face of the problems caused by waste of (fossil) plastics, European and national legislative bodies increasingly engage in activities designed to replace plastic packaging through more sustainable and – from an environmental perspective – less problematic alternatives. Especially paper packaging is often perceived as more sustainable by the consumer and are thus more and more considered by the producers of food. Since food packaging has to fulfill a protective function that paper alone cannot serve, paper-based packaging must be functionalized with additional barrier and sealing layers. Additionally, the transition from plastics based to paper based packaging demands considerable effort from companies, since paper has different mechanical properties compared to plastics and thus behaves differently on packaging machines.

This challenge was taken on by the consortium of the Flemish partners MPR&S (Hasselt University), Sirris, Pack4Food and Flanders' Food, the Polish partners CBIMO (Westpommmeranian Technical University Szczecin and Natureef as well as the German partners Fraunhofer IVV and IVLV in the Cornet project REPAC². The goal of the project was to facilitate the transformation process from plastic to paper packaging by following the process in case studies and addressing issues arising within these.

Inventory In a first step, an inventory of paper coatings and coated papers was conducted with incorporation of the user committee. The inventory considered materials that were market-available or up to two years from market at the onset of the project. Based on the available information on the more than 70 registered materials, 15 materials were selected for further studies.

Characterization Among the 15 materials, two were coatings. For these, different coating techniques and parameters were tested to find the optimal conditions for coating them on papers. For all coated paper, a series of properties were determined: mechanical (tensile strength, tear resistance, puncture resistance, abrasion), heat seal (hot tack and HC sealing) and barrier (water vapor, oxygen, liquid water, oil/grease, air permeance). The properties of the tested materials are available online.¹ In addition, the sealing layers were examined spectroscopically.

Sustainability Since the transformation to paper based packaging is driven by the desire for more sustainability and a more circular economy, two aspects of sustainability were studied: recyclability and environmental footprint. The recyclability was assessed according to the harmonized European laboratory test method by CEPI. In this approach, paper samples are subjected to a series of processing steps: pulping, screening and sheet formation. The yield from the screening process, sheet adhesion and visual quality of the sheets are the basis for a score, which reflects the recyclability in a standard paper mill. Of the studied materials, only three failed according to the CEPI score, all others are considered recyclable.

The environmental and carbon footprint of the papers were determined for the packaged foods from the case studies according to the methods of life cycle analysis (LCA). The functional unit was the respective packaged food, with the analysis comparing the market-available established packaging with the suggested paper-based packaging. The contribution of the packaging to the carbon footprint was, depending on the case, between 1.7 and

¹ https://www.sirris.be/en/database_coated_paper

29.7%. The carbon footprint, in turn, contributed between 7.6 and 29.7% to the product environmental footprint. In comparison, the established and alternative packaging differ only slightly. Especially for the product environmental footprint, the studied packaging variations with their respective food are nearly identical. For the carbon footprint, the differences are small as well, though the paper based alternatives came up to a higher footprint and thus performed slightly worse than the established packaging solutions.

Matchmaking For the preparation of the case studies, producers of food and packaging from the user committee were brought together in talks moderated by project partners. From these talks, six case studies emerged, in which the transition process and possible obstacles were to be tracked. The food products for the case studies were: dried fruit rolls, sliced salami, chocolate truffles, oily crackers, tea and chocolate tables.

Furthermore, a broad matchmaking event was conducted. Here, companies from the food and packaging sector had the opportunity to pitch their challenges and solutions, respectively, before engaging in talks about prospective collaboration. Here, the goal was to establish new and transregional contacts to facilitate a long-term transformation of the food packaging market.

Shelf life The protective function of the packaging was studied in shelf life studies. To this end, the foods used in the case studies were characterized to sufficient extent. Based on this, shelf life simulations were conducted to estimate the shelf life in the alternative packaging. All in all, the suggested alternative packaging materials showed promising protective properties. In parallel, an approach for comparing established reference packaging with possible alternatives on a quantitative was developed and tested. This approach is supposed to aid in a rapid and automated identification of possible alternatives to established packaging. The comparison yielded similar pairings as the matchmaking. Storage tests, too, showed many of the suggested materials to be promising.

Case studies – implementation in companies Of the six planned case studies, only three could be carried to completion, for a number of reasons. In some cases, difficulties handling the materials emerged, for example as tears of due to the paper being stiffer than plastic materials. Within the completed case studies, the tested paper based packaging solutions proved suitable. A detailed report on the case studies is available online.²

In summary, paper based packaging turned out as viable alternatives to plastic based packaging for the studied foods. Potential obstacles were identified and can be anticipated in future implementations of a transformation process. Central project results and descriptions of the used methods are compiled in a white paper.³

IVLV members can download the complete final German project report from our homepage. All you need is to register in the section “[My IVLV](#)”. Non-members can request the final report from the IVLV office at office@ivlv.org .

² <https://docs.google.com/forms/d/e/1FAIpQLSczpjADLOv8-ASJpcPcB1Lh3TmuIDOhBgqM4bAulfaennLbOOQ/viewform>

³ <https://portal.sirris.be/repac2-whitepaper>



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