



## ECOPAPER Project

Production of paper and cardboard based on using byproducts from confectionery production as a partial substitute for virgin cellulose



ecodesign

eco-innovation

circular economy

production process

eco-friendly products

reducing environmental  
impact

## PROJECT DESCRIPTION

The **ECO PAPER** project has led to an innovative concept of using confectionery production waste, previously treated as waste and disposed of by incineration, as a functional part of the final packaging of food products. The starting concept is based on the opportunity to reuse thousands of tons of waste that would otherwise be destroyed. Hazelnut shells are waste that cannot be avoided when using hazelnuts in food production. With the ECO PAPER project, this waste is transferred to a dedicated dry-milling process, thus producing hazelnut shells of a particle size suitable for the production of the cardboard of the final product's packaging. The conventional fibrous raw material for the production of paper is the pulp produced by wood through "chemical cooking" or mechanical refining, or it is recycled fiber. Wood fibers show many advantages for today's paper types but not in all cases.



## OBJECTIVES

The project aims at exploring and evaluating the possibility of partially replacing conventional wood-based fibers in the production of cardboard by reusing part of the production waste and increasing the share of recycled material inside the cardboard, seeking to ensure economic efficiency and at the same time reducing environmental impacts. The project confirmed that hazelnut shells are well suitable to increase the volume of the cardboard to be used in the packaging production, providing a greater thickness with the same amount of material. The effect of increasing the volume due to the addition of hazelnut shells to the conventional preparation of the cardboard is caused by the envelope of particles in the complex microstructure of the fiber network. The volume is very important for the cardboard, especially for the internal layers of the multilayer: a voluminous internal layer increases the stiffness of the cardboard folding, which is essential both for transport packaging and for display packages.

## PROJECT PHASES

The project consisted of the following main operational phases:

- Elaboration of the recipe: development in laboratory of the board recipes, process investigations, and analytical characterization of the material; overall, this phase provided the first necessary knowledge for the structuring of a multilayer cardboard with reuse of hazelnut shells and cocoa bean skins. This phase was important in order to understand the initial limits of the laboratory tests and indicate corrective measures for any eventual problem at the industrial level.



- Cardboard production: following the first preparations produced in laboratory, industrial tests were carried out. The tests performed at the mill resulted in a cardboard of satisfactory quality. In the end, the addition of ten percent of hazelnut shells to the central layer proved to be the optimal solution in order to satisfy all quality parameters. The recipe optimized for grinded hazelnut shells has proven to be well workable at the mill and machinability level, as well as at the water circuits level. The tests of the industrial mill were the core business of the development work.
- Processing test: the last operational phase included processing tests for the cardboard produced in standard package, thus involving several downstream phases such as printing, die cutting, folding and gluing. This phase was important and fundamental for evaluating the quality and machinability of the produced cardboard. In fact, cardboard with the same quality parameters can have different behaviors depending on the composition.

## PROJECT RESULTS

All relevant production phases of the new packaging product have been validated within the Eco Paper project. Between hazelnut shells and cocoa bean skins, the work has focused more on hazelnut shells, which have proven to be more suitable for this type of processing. The use of the cocoa bean skins has led to a good level of cardboard quality or in any case to a quality satisfying the required technical specifications, but some operational drawbacks also occurred that have required corrective measures. Consequently, the use of cocoa bean skins was not further studied in the project.

As for the recipe in compliance with the required quality characteristics, the optimal result has been obtained mixing 10% of hazelnut shells in the intermediate layer. Another important result was the reduction of the allergenic potential of hazelnut shells through a specific pre-treatment process. A first processing test of die-cutted (not pressed) packages was performed on a display package. The project has given good basic results which, however, will have to be confirmed and further investigated through new tests to correct and refine the applications and define the possible implementation, as well as possible exploitation of the project results.

Further details are available in the [Laymans' Report](#).



**Acronym**  
ECOPAPER

**Number of reference**  
ECO/11/304337

**Reference Programme**



**COMPETITIVENESS AND  
INNOVATION FRAMEWORK  
PROGRAMME (CIP) ECOINNOVATION**

**Beneficiary Coordinator**

Ferrero S.p.A.

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**EU contribution**

599.478,00

**Call Year**

2011

**Start Year**

2012

**End Year**

2015

**Beneficiary headquarters**

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**Region**

Piemonte

**Description**

Piemonte, Germania, Spagna