EXECUTIVE SUMMARY

DESCRIPTION

WHEYPACK project aims to demonstrate environmental and socio-economic benefits of a biodegradable food packaging material with a lower environmental impact through the reduction of greenhouse gas (GHG) emissions in comparison with current petrol-based food packaging materials. The biodegradable food packaging material selected is Polyhydroxybutyrate (PHB) that will be obtained from a by-product (whey) that comes from the cheese industries; PHB will be produced using a process of microbial fermentation.

The amount of whey produced in Europe is really important and it is a surplus of this industry. The PHB material will be used for the production of economic and competitive packages for dairy products uses. Hence, the industry that generates whey, among others, will become the beneficiary of the new packages tailored to the needs of their products, so valorising the whey surplus and closing the life cycle, taking into consideration the lyfe-cycle thinking perspective.

WHEYPACK project wants to demonstrate that carbon footprint of manufacturing process of PHB-based food packaging is lower than current manufacturing processes of PP-based ones.

To achieve this, WHEYPACK project has been divided into two main processes: fermentation process for obtaining PHB material from whey and biopolymeric injection process for obtaining food packaging.

Regarding to the fermentation process, the target of WHEYPACK project is to demonstrate that the production of PHB from whey has a lower carbon footprint than the current process for plastic production from fossil sources.

Additionally WHEYPACK project will demonstrate that this process is both economical and ecological efficient and it can be used as an alternative for whey disposal in all European dairy food industry.

Regarding to the injection process, the scope of WHEYPACK project is to demonstrate that the current manufacturing processes of polymeric food packaging can be used for obtaining biopolymeric packaging without increasing the carbon footprint of the whole process.

On summary, first of all WHEYPACK project will generate PHB from whey by means of a fermentative process. Secondly, this PHB material will be modified with different additives in order to obtain a final PHB-based material which can be processed with the same technology as polypropylene-based material.

Then, PHB-based trays will be produced by injection moulding technology. Finally, the food application of PHB generated trays will be tested with cheese products. Thus, WHEYPACK project can be considered as a close loop project, due to the whey generator (cheese industry) will become the beneficiary of the new PHB-based packaging, tailored to the need of its products.

The project is being performed trough a cross border collaborative project (Spain and Portugal) with a multidisciplinary human work team with high experience in food technologies and production, bioprocess technologies, microbiology, physical-chemical analysis, polymer technology and food packaging manufacturing.

OBJECTIVES

WHEYPACK project wants to demonstrate that carbon footprint of manufacturing process of PHB-based food packaging is lower than current manufacturing processes of PP-based ones.
The main objectives of the project are:

1. Demonstration of the environmental, technical and economical feasibility of performing PHB based packaging manufacturing processes from whey, considering all the chain steps involved in this industry so closing a loop: 1) PHB bioproduction from whey, 2)polymer compounding, 3)PHB-based package manufacturing and 4) use by the cheese maker at a small scale. So the key stages of the chain are considered in the project.

2. Demonstration that total greenhouse gas emissions (carbon footprint as CO2 equiv.) of the production process is lower than current manufacturing process of petrol-based food packages (polypropylene, PP).

3. Definition of the PHB bioproduction and recovery processes from whey at pilot plant scale. Study of the scale up conditions from pilot plant to industrial scale.

4. Formulation, compounding and adjustment of the PHB polymer in order to improve its processability properties for injection moulding process.

5. Development of 100% biodegradable PHB-based packages (trays) and demonstration of their application to dairy products: cheese packaging.

RESULTS

The main expected results are:

1. Reduction of 35% of the total carbon footprint of the PHB-based packaging manufacturing processes (using whey), taking as a reference the PP-based packaging manufacturing ones.
2. 75% reduction of the BOD (biological oxygen demand) and 40% of the COD (chemical oxygen demand) of "industrialized" whey by-product (after its use for PHB production) when compared with original whey by-product without treatment.
3. Eco-efficient viability of PHB bio-production processes from whey with productivity more than 20g of PHB/litre.
4. Reduction of the production costs of PHB polymer up to 50% due to the use of by-products from dairy industries (revalorisation of whey surplus) instead of purpose-grown crops as raw materials.
5. Obtaining a 100 % biodegradable packages (200 units) based on PHB polymer obtained by injection moulding processes (trays) with demonstrated application on dairy products (cheese).

PARTNERS

AINIA is a private non-profit technological centre, created in 1987 and formed by companies from the Agri-Food Sector and related industries (packaging, cosmetics, pharmaceutics…), whose objective is the promotion of innovation and technological development.

AIMPLAS is a Technological Institute focused on plastic sector, with more than 100 professionals with huge expertise in compounding, processing, recycling, product development and analysis of plastic materials for different sectors, such as construction, automotive, packaging and other traditional ones.

EMBALNOR was founded in 1997 and since then its core activity has been the injection of technical plastic components. Started with its own line of food packaging as an effort to position itself in the market with its own product, soon packing became the "core business" of the company expanding from food to a wide range of packaging for chemicals area and medical waste.

CENTRAL QUESERA MONTESINOS was founded in 1978 and has grown consistently every year. It is an award winning cheese manufacturer, having won numerous awards in both national and international cheese competitions, one of the most recent international awards being the World Cheese Awards in London, November 2012.