



ENBED

Environmental benefits through the decrease of food product loss and waste

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eco-innovation
WHEN BUSINESS MEETS THE ENVIRONMENT



INTRODUCTION

The ENBED project (**E**nvironmental **B**enefits through the **D**ecrease of food product loss and waste) has been co-funded by the European Union within the CIP Eco-Innovation initiation of the Competitiveness and Innovation Framework Program (CIP).

Project lifetime:

15th July 2010 to
14th July 2014.



BACKGROUND

Loss and damage of perishable goods during storage and transportation is a substantial global issue, with some industry sources estimating that losses of up to 33 percent on perishable freight are common.



It is very clear that if a food product can be monitored in real time, all across the cold chain, it can bring tremendous benefits by enabling the optimization of the Cold Chain to work properly and take corrective actions, in real time, for those activities that are caused by human error or machine malfunction and

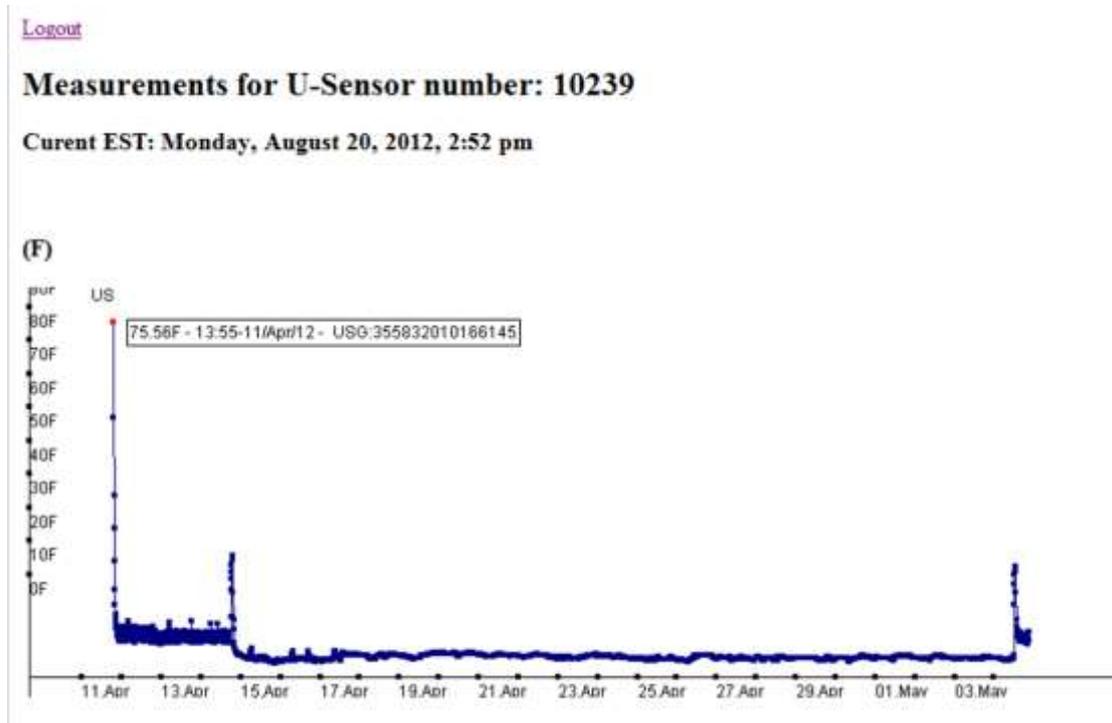
provide new processes of handling food based on FEFO (First Expired First Out) algorithm.

PROJECT GOAL

The objective of the project was to commercialize a solution for the monitoring and control of the cold chain channels for Food related products based on a solution that was already available and was successfully deployed in the post-harvest (vegetables and fruits) market.

Unlike other solutions that monitors the environment of which the product is going through, this technology is enabling the real time monitoring of the product itself during its journey in the cold chain.

The environmental data , of the shipped product, is collected and transmitted in real time to a central server with Web access.



ENBED SOLUTION

CartaSense solution, real time monitoring of food products in transit and storage, meets customers' needs and provides large companies, logistics companies, food distributors and retailers with the core capability and tools to build a cost effective, real time, total monitoring solution they need.

CartaSense Technology concept is based on

Cost effective, easy to use, wireless sensors

Flexible, easy to install gateways

And servers



Targeted to:

Real time data collection

Help the end customer make timely business decisions

Reduce waste and losses

Save energy

Increase supply chain efficiency

Retain food quality

Prevent safety hazards

The environmental data is collected and transmitted in real time to a central server with Web access.

PROJECT PHASES

The project workplan was made up of eight workpackages:

WP1 - Project management

WP2 - Dairy Cold Chain Analysis

WP3 - Dairy Cold Chain Tuning

WP4 - Dairy Products & process implementation

WP5 - Market Research for the deployment of a Pan European Solution

WP6 - Exploitation and Business Plan

WP7 - Priority countries deployment phase

WP8 - Dissemination Activities

PROJECT OUTPUTS

RESULTS

During the project CartaSense completed successfully all the tasks and met all the objectives that were set at the project start.

CartaSense researched the reasons why monitoring systems were not commonly used in shipments or warehouses, while it is obvious that it saves waste, energy and water, reduces pollution and retains food quality – thus, \$\$\$

CartaSense realized that the barriers for using monitoring systems only in the fixed locations (Warehouses and trucks) are high cost; poor performance, poor robustness and the overhead of data collection while solutions to monitor the goods while in transit were not cost effective and complex to use.



To overcome those issues, during project execution some technical improvements in CartaSense solution were done.

- **Improvements at sensor level** – As the project evolved, new requirements came up. There was a need to monitor cold rooms and products in transit in a temperature below -20C. For this purpose, an extended temperature range sensor was developed, another issue that came up is the operating



- time of the sensor. When a sensor is shipped by sea, it needs an extended operational time. The U-Sensor currently can operate for 200 days with a coin battery. Mechanical improvements were also done to meet those requirements. Furthermore, it was found that a new sensor for outdoor use is required to be placed at sea ports, Additionally Certification for food and Pharma level EN 12830 , WHO and Certification for air carriers DO 160 F were generated to improve the usability of the system
- **Improvements at Gateway level:** The gateway is actually the reader of the data measured by the sensors. There were some changes made in the mechanical structure. Considering that gateways are going to be spread out, a capability to upgrade via SMS was added to the gateway. That way, there is no need to physically attend the gateway location, but remotely upgrades the gateway, by upgrading via SMS. We faced the fact that the gateway doesn't always connected to a power source and requires an extended battery life and new algorithm to support 60 hours of operation. This provides the flexibility to leave the gateway in the truck while parking and still transmit in real time.
- **Communication Server and application:** Add support for Oracle DB, Support for FDA 21 CFR part 11 for food and Pharma, Improved application API
- **Application:** Integration of Shelf life algorithm to enable FEFO operation, Integration of MKT support, Support for clusters of sensors, to view groups of sensors in a truck, or a shipment, a warehouse. At the

same time an additional support was added to enable the view of the real layout of of the sensors in the warehouse.

- **Alert mechanism:** a special alert mechanism was added to enable real time alert by either SMS or email to an individual or a group of people.



The Results of the project highlighted that the **optimal storage temperatures during logistic chain were not always guaranteed.**

Thus, it was possible to identify the critical point of the distribution chain that caused a reduction of the quality and waste of products.

A very focused and detailed research was conducted with a food product that was not supposed to be sensitive to changes in the environmental conditions. Critical and safety quality characteristics of a vegetable cream) were identified in order to develop a mathematical model for shelf life estimation and prediction as a function of temperature fluctuation.

The shelf life of the product was estimated at several temperatures in order to predict the reduction of product shelf life during distribution chain.

The results highlighted that for the specific product the critical temperature reached during distribution time didn't determine only a faster kinetics of quality decrease, but mainly induced new physical and chemical change that cause the end of product shelf life.

Therefore, **changes in temperature during transportation has a big impact on the product shelf life.** Even if distribution time is short compared to the shelf life of the product at optimal storage temperature.

Using the real-time monitoring identified that even this insensitive product could get, in some routes a substantial decrease of shelf life in 50% of the shipments.

Similar tests, on other products, such as mayonnaise and ice cream, performed in other locations, provided similar findings .Highlighting the need for such a real time monitoring solution.

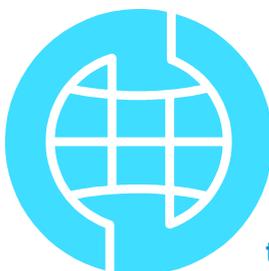
MARKET

Market research was done in nine countries compiling information about food industry, dairy industry, Technologies for monitoring cold chain and status of food losses and food waste.



Derived of it the main principle of ENBED strategy was defined: **focus on specific market segments that have a major impact on the target markets; large international food manufacturers; large food chains; third party logistics specialized in food products and system integrators.**

As a result of the ENBED project, CartaSense was able to approach and reach substantial agreements with key, large, international companies in the target market segments. Among them, very large food manufacturers, leading 3PL (third party logistic companies), large food chains and leading equipment vendors that provide products and solution to the cold chain users.



Additionally it has been achieved INTERNATIONAL RECOGNITION around the world in the food market, and NEW FOOD MARKETS identified for the technology.



PROJECT PARTNERS



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