
CHILL-ON

Improving the integrity of chilled food products

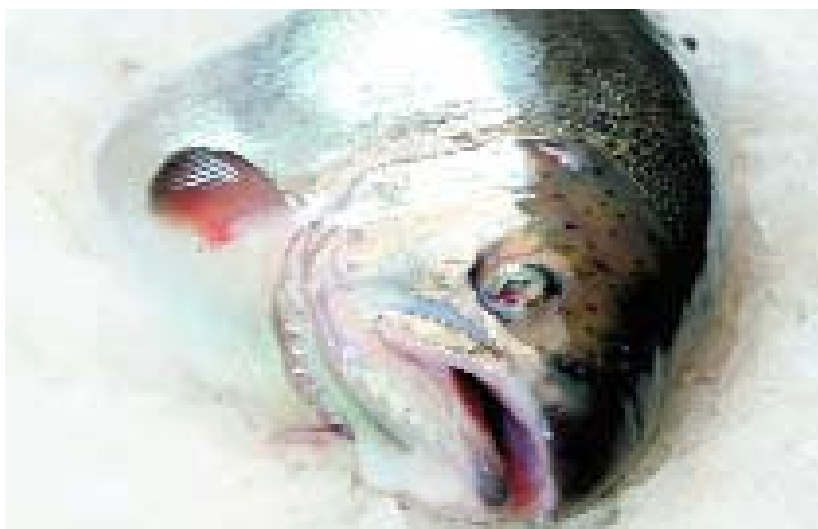
The European Union is the second-largest market in the world for frozen food products. The consumption of chilled and frozen food products in Europe is experiencing above-average growth at over 10% a year, yet food safety remains a major concern for consumers. Unfortunately, there is still no integrated concept available for the chilled and frozen food chain that allows both the complete and continuous monitoring of food safety and quality and the traceability of the entire food chain.

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A project, called CHILL-ON, which aim is to improve the quality, safety and transparency of the chilled food supply chain started in July 2006. The 16 Mio project, is funded by the European Commission, and is carried out by a consortium consisting of 29 partners from 14 different nations. One of the partners is a new Icelandic food research company called Matís - Food Research, Innovation & Safety.

The role of Matís in CHILL-ON

The role of Matís (formerly Icelandic Fisheries Laboratories) in the CHILL-ON project is mostly shelf life studies, evaluation of cooling techniques, microbiological analyses, mapping of the chain supply etc. Matís also participates in the development of technologies which both contribute to increased efficiencies of the supply chain and improve the safety and quality of selected frozen and chilled food products (i.e. fish & seafood / poultry). This is done by comparing different chilling technologies with regard to heat transfer, cooling rate, cooling capacity and their applicability in the different links in the supply chain. In order



to evaluate the effect of different chilling technologies for the extension of shelf-life and improved quality of products, a research on the influence of the chilling methods on the physical and sensory characteristics will be carried out.

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The CHILL-ON project, which is co-ordinated by the Technology Transfer Centre (TTZ) in Bremerhaven, Germany, aims to develop for the first time an integrated solution for the entire frozen and chilled food supply chain. This will be done by implementing an interdisciplinary R&D work programme which includes a very wide spectrum of disciplines, ranging from biochemistry, genetics and microbiology, through chilling, packaging, and logistics to IT.

Fish is the third most-consumed food product in Europe and, with its relatively short shelf life, it is sensitive to food poisoning. Therefore, the chilled and frozen fish supply chain was selected as the test case for this project. To ensure the transferability of the results to all sectors, poultry meat was selected as the second high-risk product group to be studied.

eChill-On Smart Label - Novel Tracing Technology -

The focal point of the research is the development of eChillOn Smart Labels, a combination of a Time-Temperature Indicator (TTI) and Radio Frequency Identification (RFID) tag.

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Today, commercially available intelligent packaging concepts are usually based on labels showing a visible change in response to time and temperature of the product or the presence of certain chemical compounds. The basic principle of TTI's is a time-temperature dependent irreversible colour change that reflects the full or partial temperature history of a single product.

TTIs help determine "sell-by-dates" but without additional information about how the product was stored (e.g. storage temperature etc), it is impossible to accurately determine the expiration date of a product. This forces suppliers and retailers, who want to be on the safe side, to reduce the shelf-life of products, thus reducing possible revenue.

For the identification of a product's location, ID, time of receipt both types of RFID tags, passive and active will be used to transmit the required data. RFID and TTI are not, however, used only as stand alone technology. Combining both is the technological challenge in the project.

TTI and RFID will be connected by an interface that relies on an electronic component, usually a capacitor or resistor, that changes its electronic properties and characteristics as a function of the temperature and time. The

novel technology senses temperature and integrates it over time to determine the shelf life and the information can be communicated via RFID. The rf-TTI device changes both colour and rf response in a way that allows the end user to evaluate freshness and to measure the remaining shelf-life more accurately. The information stored in the eChillOn Smart Labels not only allows the tracking (what, when and where), but also the tracing (what, when, where and in which condition) of a product.

State of the Art Packaging Concepts

The integration between packaging and RFID technologies is a complicated issue, which is not fully solved yet. It entails several issues like legislation, privacy issues, location of the smart label, the material of the package, the cost of packaging and labelling process. CHILL-ON works on the evaluation of different alternative techniques to integrate the RFID smart labels into the packaging, evaluating different kinds of packaging and materials. It will consider "Multi-Criteria Selection Methodology" where the cost of packaging and cost of process will be the main issues.

Low Temperature Preservation Against Bacteria Contamination

Current cooling technologies have certain limitations, since most of them create air pockets where no cooling takes place, while at the same time, traditional ice can produce freeze burns (noticeable in fish by red spots on the skin), due to the extremely low temperature of the ice crystals. It has a low heat transfer coefficient, preventing rapid and uniform cooling. This is facilitating bacterial growth, enzyme reactions, discolouration and as such, extensive product degradation and shorter shelf life.

A complete new approach is the so-called "Bubble-Slurry-ice" which is based on a patented Wiped Surface Crystallizer System (WSCS), producing airy ice crystals inside the cooling medium, instead of on the crystallizer's walls. It produces up to 50% real ice concentration, making ice with an initial water temperature of up to 35 C. The product, "bubble slurry ice" will be formed by crystals of 5 micron. This means that the ice completely encompasses the product without creating air pockets., permitting maximum surface contact.

Risk Assessment and Avoidance by TRACEHILL

CHILL-ON intends to research, develop, and integrate the post advanced

information and communication technologies into a tool which will be called TRACEHILL. This tool will provide a total solution for tracking and tracing, based on an integration of technologies such as GPS, GIS, RFID Internet and cellular networks.

TRACEHILL will enable the access to all required information for the supply chain and shall provide the platform for traceability and complementing services.

Specific Supply Chain Management Software for the chilled and frozen industries will help managers to gain insight into the quantity and value of product flows, inventory and production.

The project will also implement an extensive study of the existing and emerging data communications, processing, transmission and presentation interfaces and standards.

As the work of the project is distributed across a number of technologies as well as socio-economic objectives, particular attention has been paid to ensure that the activities of CHILL-ON are coordinated effectively and efficiently and is closely aligned to the objectives of the projects stakeholders.