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The FRISBEE expected results

The project will develop new innovative mathematical modelling tools that combine food quality and safety together with energy, environmental and economic aspects to predict and control food quality and safety in the cold chain.

We expect FRISBEE to contribute to reductions in energy consumption in refrigeration processes. Worldwide, refrigeration consumes 8 % of all energy and is responsible for 2.5 % of greenhouse gas emissions; therefore any reduction in those figures will be a big improvement.

FRISBEE is a Refrigeration Innovation for Food Cold Chain Research European project IP. The four-year, 6 M euro project is funded mainly through the EU's 7th Framework Programme.

We have begun by developing a comprehensive database on the cold chain in Europe, identifying refrigeration needs and available current technologies in the food industry, and investigating consumer needs and expectations with respect to the food cold chain.

FRISBEE Partners

26 partners comprising 13 companies, 11 research institutes or universities, and 2 non-governmental organizations.

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NEWS

FRISBEE welcomes NEW MEMBERS Advisory Board

New Members of the Advisory Board are welcomed. The AB, already composed of large food producers, is now also glad to welcome as well refrigeration associations, refrigeration equipment manufacturers, storage

stakeholders (Association Française du Froid, Ingerson Rand, MFConseil). They will provide important advice regarding the scientific and technical orientation of the **FRISBEE** project. **You can still apply to join us!**



FRISBEE on the starting-blocks for The FIRST European Field study on food cold chain– Monitoring product temperature history throughout the whole cold chain from the production phase to the consumer domicile.

Four FRISBEE partners in four European countries, Greece (National Technological University of Athens), France (CEMAGREF/IRSTEA), UK (London South Bank University) and Belgium (Katholieke Universiteit Leuven) will all together conduct this field study from production plants to consumers homes with the same type of product (cooked ham) in four representative European markets. The goal of this field study is to identify the weakest link of cold chain to improve the food quality and safety. FRISBEE project is going to launch the first European Field study on cold chain this summer 2012.

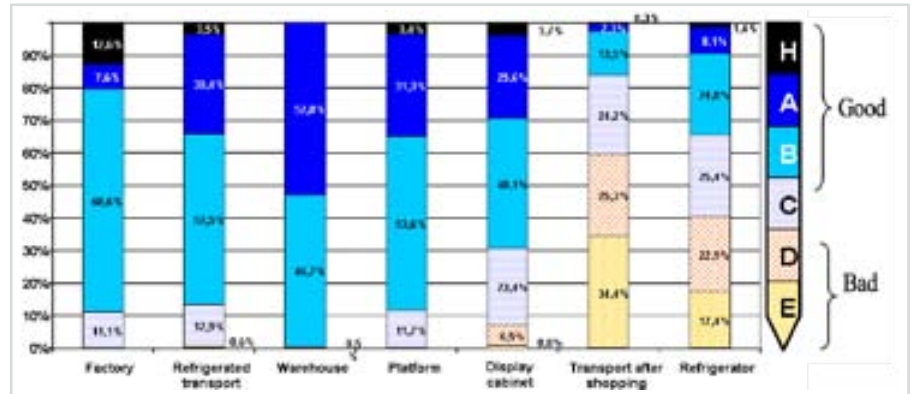


Figure 1. French Cold Chain Survey, France. Source Cemagref 2005

Temperature recorders will be incorporated inside of the ham packaging at the end of the production to follow the product temperature up to the consumer. The FRISBEE database will also

be enriched with this future temperature data. The respect of the cold chain is essential for maintaining food safety for refrigerated products.

RESEARCH

SUPERCHILLING! A new technology to have your food products fresher than fresh

SUPERCHILLING is a novel refrigeration technology where the fresh products are stored at temperatures just below it's initial freezing point, normally between -1.0 to -1.5 is being developed by the Norwegian center SINTEF together with other partners in the FRISBEE project.

The decrease in temperature can be effective done by shell-freezing by impingement freezers. This leads to an increase in shelf-life of 100 % compared to traditionally 4 °C storage. The strictly controlled temperature during storage ensures less than 20 % of the water inside the product is frozen.



This low part freezing does not influence on the quality compared to fresh products. Prolonged shelf-life reduces the demand of freezing within the abattoirs, and the total refrigeration energy within the plant is reduced by 12 %. The technology is suited for all kinds of meat and fish. In fish production, the yield is increased by 2-3 %. Transportation of superchilled fish reduces the environmental impact by 30 % due to the fact that no additional ice is needed in the fresh fish boxes.

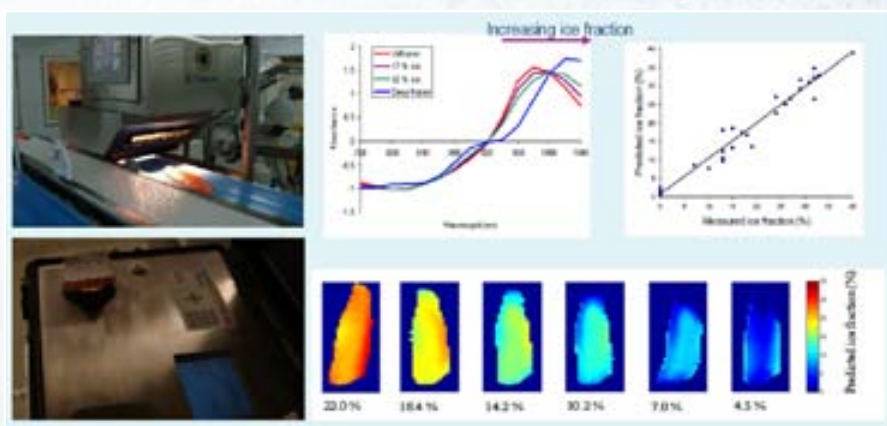


Figure 2. SUPERCHILLING test at SINTEF, Norway



MAGNETIC REFRIGERATION TECHNOLOGY. FRISBEE's experts team work on this DISRUPTIVE TECHNOLOGY

Camfridge Ltd (UK) develops Disruptive Technology: Magnetic refrigeration inside the FRISBEE project. Magnetic refrigeration is being developed as a gas-free and high-efficiency green technology, and will enable the next generation of low energy appliances. Magnetic refrigeration utilises magnetic fields and optimised iron-based metal alloys to create a cooling cycle. Although the refrigerant is a solid the cooling cycle is conceptually similar to the expansion of the compression of a refrigerant gas, but in magnetic cooling the "gas" is the electrons inside the solid.

The key challenge has been to scale the size of a magnetic cooling



Figure 3. Magnetic cooling system developed by Camfridge Ltd (UK)

system down to being comparable to the gas compressor. The figure below shows the most recent magnetic system developed at Camfridge LTD next to the gas compressor it is designed to replace. For the first time the magnetic solution is now comparable in terms of size and weight to the gas compressor. An integrated appliance will be showcased at the 2012 London Olympics with Whirlpool Corporation. Future development will focus on further improving reliability, optimising operational efficiency and expanding the supply chain.

SAVING ENERGY by REFRIGERATION PREDICTIVE CONTROL

CEMAGREF/IRSTEA (France) develops together with other FRISBEE partners the refrigeration



Figure 4. Predictive Control by CEMAGREF - IRSTEA (Fr)

model predictive control that optimises energy consumption, operating cost and food quality. This is a powerful tool to optimise the operation of the refrigeration systems encountered in the food cold chain. It is based on a very simple methodology: if you manage to know the future, or at least to guess what is probably going to happen, then you can start preparing for it in the best way. Imagine you manage a refrigeration unit with a cold storage tank that maintains the temperature of a warehouse at -20 °C. On the one hand, the weather forecast allows you to compute the heat losses.

On the other hand you can estimate the thermal load associated with the shipment you expect to receive. Therefore you can have a fairly good idea of the total amount of energy needed for the next 24 hours. If you operate air-cooled condensers, you can, with the help of the weather forecast, optimise their efficiency by turning them on at the coldest hours and storing the produced cold in the cold tank. As a result, you have minimised the amount of energy consumed and optimise the quality of your products by maintaining appropriate conditions.

UPCOMING FRISBEE EVENTS

Date	Name of the Event	Organised by	Location
9 February 2012	TOBB (Union of Chamber and Commodity Exchanges) meeting	SETBİR	Istanbul, Turkey
14 February 2012	Miempresa Meeting (www.creaventure.com)	FIAB	Madrid, Spain
16 February 2012	FRISBEE Industrial Mini conferences	FIAB, GEIE	Paterna (Valencia), Spain
8-9-10 May 2012	CIBUS Parma fair	FED	Parma, Italy
25-27 June 2012	Conference Gustave Lorentzen on natural fluids	IIR	Delft, The Netherlands
July 2012	Innovation meeting	ANIA	Avignon, France
2-4 April 2013	2nd IIR International Conference on Sustainability and the Cold Chain	IIR, CEMA	Paris, France