



FOOD, AGRICULTURE AND FISHERIES, AND BIOTECHNOLOGY



FRISBEE

Food Refrigeration Innovations for Safety, Consumers' Benefit, Environmental Impact and Energy Optimisation Along the Cold Chain in Europe.

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1. Objectives

The main objective of this action is to encourage, stimulate and enhance collaboration with other projects, especially European projects dealing with common issues in order to get synergistic effects.

The set up and 3 other versions are requested Deliverable.8.6.1, Deliverable.8.6.2, Deliverable.8.6.3 and Deliverable.8.6.4.

2. Description

Collaboration with 6 European projects has been recorded during the 6 first months of the project: AgriFoodResults, RELATE, CAFE, DREAM, ICE-E and InsideFood

Collaboration with AgriFoodResults has been performed in the context of the virtual supermarket representing an efficient tool to communicate research projects' results to industry and consumers.

Collaboration with RELATE has been performed in a context of training activities while collaboration with CAFE, DREAM, ICE-E and InsideFood was established in the context of the organization of two common workshops in which they have been invited for presentations.

2.1. AgriFoodResults project and the Virtual Supermarket

AgriFoodResults is a European project (CSA supported in FP7) ended in June 2011 and intending to answer the need for a better dissemination of results of food research. The vision is to improve the cost effectiveness of agri-food research activities by enhancing the transfer of the results to the end-users. The project combines capacity building with the creation of sustainable services for dissemination managers. These services include once [web](#)-sites, innovative approach to communicate scientific results and guidelines for project and dissemination managers.

The main outputs are:

1. Two web-sites: one on dissemination practices (for dissemination managers, with guide of good practices, directories of contacts, database of information relays) and one on food scientific results (for end-users, with a database of scientific results in food science).
2. An innovative and sustainable web solution for communicating project results so called the **virtual supermarket**
3. Four guides of good practices:
 - i) A guide of good practices for the dissemination manager
 - ii) A guide of good practices for communication with food SMEs
 - iii) A guide of good practices for communication with policy makers
 - iv) A guide of good practices for communication with consumers
4. One European conference on dissemination practices including the award of prizes for the best dissemination activities of European projects in food sector.



Introduction of FRISBEE is available in the virtual supermarket.

The virtual supermarket is available in the website of AgriFoodResults project:

www.agrifoodresults.eu

The virtual supermarket represents a very innovative and interactive tool appreciated by industrials as an easy access of research projects' results.

2.2. RELATE project

ReLaTe (REsearch LABs for TEaching Journalists) is funded by the European Union, and its main goal is to strengthen the relationship between scientists and journalists to improve the dissemination of scientific topics to the general public. This initiative gives journalism students the chance to enter research laboratories spending one week side by side with scientists, and it promotes a stable dialogue between the two fields. The initiative, which started in November 2009, has already involved about 20 laboratories and 50 journalists from all over Europe.

The European project FRISBEE (Food refrigeration Innovation for Food Cold Chain) coordinated by Cemagref in Antony, France, hosted two journalists from November 22th until the 26th: Laura Pardo, from Spain, and Ines Jokoš from Croatia. Laura Pardo has a degree in journalism, and has worked as a graphic designer, scriptwriter and camerawoman. Ines Jokoš has a degree in journalism, and has worked as a journalist in a tv program and has been also involved as a researcher in several projects lead by the University of Zagreb. During the training, students had the opportunity to work as real journalists, interviewing researchers and getting to know their work, to produce communication materials ready to be distributed to media outlets.

ReLaTe project is managed by Minerva, a communication agency in Brussels and sees the involvement of several other European organisations such as the EJC (European Journalism Centre) in Netherlands; ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development); TUBITAK (The Scientific and Technological Research Council of Turkey); and EPFL (L'École Polytechnique Fédérale de Lausanne) in Switzerland.

2.3. Organization of a workshop with CAFE and DREAM projects

“Refrigeration Innovations and cold Chain Management” workshop has been organized by FRISBEE at ICEF 11 workshop at Athens (Greece), Hilton hotel the 26th of May 2011.

Food Engineers meet every 3-4 years at ICEF, the International Congress on Engineering and Food that has been established as the major international event in the field. Greece was awarded by the IAEF delegates to organize the Congress ICEF 11 held in Athens, 22 to 26 May, 2011.

The main objectives of ICEF 11 are to provide the forum for discussion of research results and new scientific knowledge, promote personal contact and synergism, advance interaction between academia and industry and facilitate exchange of information on new processes and equipment.

The Theme of ICEF 11 was “**Food Process Engineering in a Changing World**”, allowing to explore how food engineering can contribute to the solution of vital problems in a world of increasing population and complexity under severe constraints of limited resources of raw materials, energy and environment.

CAFÉ - Computer-Aided Food processes for control Engineering

17:00 Computer- Aided Food processes for control Engineering, European project CAFE. Antonio Alonso, CISC, Spain (see complete agenda below in Annex 1)

The objective of the CAFÉ project is to provide new paradigms for the smart control of food processes, on the basis of four typical processes in the areas of bioconversion, separation, preservation and structuring. The novelty of the project lies in the capacity of combining PAT (Process Analytical Technology) and sensing devices with models and simulation environment with the following objectives:

- (1) to extract as much as possible information from the process/plant in the form of precise estimations of unmeasured variables defining, in particular, product quality, and of physical parameters changing as the process dynamics does or difficult to know beforehand;
- (2) to save and encode in a reliable and usable way, basically via physical/deterministic models;
- (3) to develop control methods to keep uniform quality and production despite the variability in the raw material and/or to respond to sudden changes in the demand.

The four selected case studies are: wine making (bioconversion), microfiltration of food beverages (separation), freeze-drying of lactic acid bacteria (preservation), and **ice cream crystallization (structuring)**.

The last point (3) is representing the more common interest point between CAFE and FRISBEE.

DREAM - Design and development of REAListic food Models with well-characterised micro- and macro-structure and composition

17:20 Design and development of REAListic food Models. DREAM Monique Axelos, INRA France (see complete programme below in Annex 1)

The overall goal of DREAM is to develop realistic, physical and mathematical models to be used as standards that can be exploited across all major food categories to facilitate development of common approaches to risk assessment and nutritional quality for food research and industry. These models will enhance knowledge on process-structure-property relationships and facilitate the creation of a food matrix with functional and nutritional properties based on tailored microstructure from molecular to macroscopic level.

Effects of refrigeration and freezing technologies on the microstructure of different food products are representing the main common interest of FRISBEE and DREAM projects.

2.4. Organization of a common workshop with ICE-E and InsideFood projects

“**Food Refrigeration Innovations for Safety and Energy Management in Cold Chain**” workshop has been organized by FRISBEE at the 23rd IIR International Congress of Refrigeration at Prague (Czech Republic), Prague Congress Centre the 28th of August 2011.



IIR congresses are milestone events held once every 4 years, bringing together very large numbers of refrigeration stakeholders from all parts of the world. ICR2011 in Prague was a highly successful event.

The International Institute of Refrigeration (IIR, www.iifir.org) is the only independent intergovernmental organization which promotes knowledge of refrigeration and associated technologies that are necessary for life in a science-based, cost-effective and environmentally sustainable way.

ICE-E - Improving Cold storage Equipment in Europe

*15:50 Saving energy in cold stores, the ICE-E European project - **Judith Evans**, London South Bank University (see complete programme below in Annex 2)*

The ICE-E project aims to reduce energy consumption and greenhouse gas emissions from the European food cold storage sector through application of energy-efficient equipment choices in compliance with the EU's energy and environmental policies.

It provides free information and tools to cold store operators, designers and users to help them reduce the energy consumption and carbon emissions from their stores.

By using the information available they can easily:

- (1) Discover how energy efficient your cold store is
- (2) Find out how to reduce energy consumption and potential refrigerant leakage
- (3) Gain knowledge through the training and information packages.

The main common interest between FRISBEE and ICE-E is dealing with refrigeration issues and energy consumption.

Judith Evans from London South Bank University is also partner of FRISBEE that can facilitate easily collaboration between the two projects

InsideFood - Integrated sensing and imaging devices for designing, monitoring and controlling microstructure of foods

*16:10 Integrated sensing and imaging devices for designing, monitoring and controlling microstructure of food, the InsideFood European project – **Bart Nicolai**, KUL – Katholieke Universiteit Leuven, Belgium (see complete programme below in Annex 2)*

The EU FP7 project with the acronym InsideFood ('Integrated sensing and imaging devices for designing, monitoring and controlling microstructure of foods') aims to

- Develop novel instruments and software for inspecting food microstructure,
- Use them to improve our understanding of process-structure-property relationships through advanced mathematical models,
- Implement them in food processing plants.

In the framework of InsideFood, a focus on both food model systems (multiphase gels, foams) as well as actual foods (cereal products, fresh and dried fruit) is done. Further, use of the following non-invasive sensors for characterising food microstructure must be applied:

- Tomography: magnetic resonance (micro)imaging (MRI), X-ray nano and micro computed tomography (mCT), and high-resolution optical coherence tomography (OCT)
- Spectroscopy: time and space resolved NIR spectroscopy, NMR spectroscopy and multidimensional relaxation and diffusion methods

The microstructure has to be related to food quality attributes (texture as measured by compression, penetrometry and acoustic emission, water status, absence of internal defects) and safety aspects (absence of foreign materials) for the selected foods and food model systems. Then, the aforementioned microstructure sensors have to be used to improve nutritional aspects of food through the optimisation of sugar- and gluten-free cereal products.

Refrigeration and freezing process have an impact on microstructure of food and collaboration with InsideFood will allow a better understanding of the mechanisms of alteration and modification of microstructure during the process.

3. Conclusion

During the 6 first months of the project collaboration with 6 different European projects has been set up. We can consider that it is a good starting point and we will try in the future to maintain and continue this collaboration with these 6 projects, but in the same time to identify new projects with which we can develop a useful and common collaboration.

4. Annex 1



Refrigeration Innovations and Cold Chain Management

**FRISBEE Project Workshop at ICEF 11
26th of May 2011, Hilton Hotel, Athens, Greece**

FRISBEE PROJECT

Management of the cold chain is of major importance, highly correlated to food safety and quality, energy consumption and environmental impact. FRISBEE (Food Refrigeration Innovations for Safety, consumers' Benefit, Environmental impact and Energy optimization along the cold chain in Europe) is a Research Project dealing with Innovation in the Food Cold Chain. The objective of FRISBEE is to provide new tools, concepts and solutions for improving refrigeration technologies throughout the European food cold chain.

Among the tasks within the project, new innovative mathematical modeling tools will be developed 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.

The FRISBEE project (<http://www.frisbee-project.eu>) will also develop a comprehensive database of the cold chain in Europe, identify refrigeration needs and available current technologies in the food industry, and investigate consumer needs and expectations with respect

to the food cold chain. The project is developing new tools, concepts and solutions for improving refrigeration technologies along the European food cold chain.

The 4-year project (2010-2014) is funded primarily through the EU's 7th Framework Programme, and has 26 partners; 13 of which are companies, 11 research institutes or universities, and 2 NGOs.



PROGRAMME

14:30	Welcome & Introduction	15:40	Influence of ambient temperature on food safety in refrigerated display cabinets Onrawee Laguerre , CEMAGREF, France	17:10	The potential for Superchilling to enable safe, high quality and long term storage of foods Ingrid Camilla Claussen , SINTEF Energy Research, Norway
14:40	New tools, concepts and solutions for improving technologies throughout the European food cold chain, the FRISBEE project Graciela Alvarez , CEMAGREF, France	16:00	Coffee Break	17:30	Computer-Aided Food processes for control Engineering, European project CAFE Antonio Alonso , CISC, Spain
15:00	Management and Optimization of the cold chain and the development of the Cold Chain Database Petros Taoukis , National Technical University of Athens, Greece	16:30	Improvement of existing concepts and refrigeration technologies: Advanced control and thermal storage applied to food refrigeration Denis Leducq , CEMAGREF, France	17:50	Design and development of REAListic food Models with well-characterised micro- and macro-structure and composition, European project DREAM Monique Axelos , INRA, France
15:20	Towards a framework for evaluation of energy consumption, sustainability and associated food quality in the European chill chain Bert Verlinden , VCBT – Flanders Centre of Postharvest Technology Leuven, Belgium	16:50	Emerging refrigeration technologies at laboratory scale to improve food quality and reduce environmental impact and energy consumption Judith Evans , London South Bank University, UK	18:10	FRISBEE Open Discussion and Reception

Location

The FRISBEE Workshop venue will be the Athens Hilton Hotel.

The workshop is a satellite event of the 11th International Congress on Engineering and Food 'Food Process Engineering in a Changing World', ICEF11. ICEF11 will be held on May 22-26, 2011, in Athens, Greece.

Accommodation & Information

The workshop will take place at the Athens Hilton Hotel, 46 Vassilissis Sofias Avenue, Athens, Greece.

For accommodation and further information about the location, visit <http://www.icef11.org>

Registration & Cost

The FRISBEE workshop is free of charge. ICEF11 delegates are invited to participate in the FRISBEE Workshop. If you are interested in the workshop, send an e-mail to frisbee@chemeng.ntua.gr to confirm your participation.

Contact

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www.frisbee-project.eu

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 245288.

5. Annex 2



Food Refrigeration Innovations for Safety and Energy Management in Cold Chain

**FRISBEE Project Workshop at
The 23rd IIR International Congress of Refrigeration
25th of August 2011, Prague Congress Centre, Czech Republic**

FRISBEE PROJECT

The FRISBEE project (<http://www.frisbee-project.eu/>) (Food Refrigeration Innovations for Safety, consumers' Benefit, Environmental impact and Energy optimization along the cold chain in Europe) develops a comprehensive database of the cold chain in Europe, identifies refrigeration needs and available current technologies in the food industry, and investigates consumer needs and expectations with respect to the food cold chain.

The project is developing new tools, concepts and solutions for improving refrigeration technologies along the European food cold chain.

The goal of the FRISBEE project is to provide new tools, concepts and solutions for improving refrigeration technologies along the European food cold chain. Among the tasks of the project is to develop new innovative mathematical modeling 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.

The 4-year project (2010-2014) is funded mainly through the EU's 7th Framework Programme, and has 26 partners; 13 of which are companies, 11 research institutes or universities, and 2 NGOs.



PROGRAMME

<p>13:30 Welcome & Introduction Innovation on Food Refrigeration: concepts and solutions for improving technologies along the European food cold chain Graciela Alvarez, CEMAGREF, France</p>	<p>14:20 Towards the first version of the FRISBEE tool: building blocks for an high quality, low impact European cold chain Annemie Geeraerd, KUL – Katholieke Universiteit Leuven, Belgium</p>	<p>15:50 Saving energy in cold stores, the ICE-E European project. Invited project Judith Evans, London South Bank University, UK</p>
<p>13:45 European FRISBEE's Cold Chain Database, Development and potential application Petros Taoukis, National Technical University of Athens, Greece</p>	<p>14:40 Nanoparticles a concentrate of energy: PCM nanoparticles when low temperatures are needed, & Thermal energy storage: a key technology for the food cold chain Jose M. Lagarón, CSIC, Spain Denis Leducq, CEMAGREF, France</p>	<p>16:10 Integrated sensing and imaging devices for designing, monitoring and controlling microstructure of foods: InsideFood European project. Invited project Bart Nicolaï, KUL – Katholieke Universiteit Leuven, Belgium</p>
<p>14:00 The consumers and the cold chain: similarities and differences M.C. Zelen, J.F Barthe, CERTOP Université de Toulouse, France</p>	<p>15:10 Coffee Break</p> <p>15:30 Modeling ice crystallization growing using during cold chain WINTIX Sietze van der Sluis, SAINT TROFFE, Nederlands</p>	<p>16:30 FRISBEE Open Discussion and Reception</p> <p>17:10 End of the Workshop</p>

Location

The FRISBEE Workshop venue will be at the 23rd IIR International Congress of Refrigeration 25th of August 2011, Prague Congress Centre, Czech Republic

Accommodation & Information



The workshop will take place at the Prague Congress Center, Czech Republic. For accommodation and further information about the location, visit <http://www.icr2011.org>

Registration

The FRISBEE workshop is open to ICR delegates are invited to participate in the FRISBEE Workshop. If you are interested to participate in the workshop send an e-mail to Hana.Opatova@vscht.cz to confirm your participation.

Contact

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