

## 1<sup>st</sup> IIR International Conference on the Cold Chain and Sustainability Cambridge, UK - 29<sup>th</sup> to 31<sup>st</sup> March 2010

### Programme

#### DAY 1 – Monday 29<sup>TH</sup> MARCH 2010

- 2.00-3.00 Carbon Trust Road map launch in Chadwick 2 (optional event)
- 3.00-6.00 Pre-registration in Borradaile Room
- 3.00-6.00 Pre loading of speaker presentations in Lyttleton Room
- 4.00-5.30 Pharmaceuticals and the cold chain working group meeting in Chadwick 1
- 4.00-5.30 D I sub-commission on refrigerated display cabinets & energy labeling in the cold chain, joint meeting in Chadwick 2
- 6.00-8.00 Drinks reception sponsored by Nanopore Insulation Limited in the Senior New Common Room

#### DAY 2 - TUESDAY 30<sup>TH</sup> MARCH 2010

- 7.45am Registration in Borradaile Room

#### PLENARY SESSION IN DIAMOND ROOM

Chairman Robert Heap

- 8.30 Introduction from R Heap, Conference Chairman
- 8.50 Welcome from X Meignien, Deputy Director, IIR
- 9.00 Performance of the Cold Chain, from J Guilpart, Former head of refrigeration processes engineering research unit of Cemagref, French delegate to the IIR

#### PAPERS SESSION I - TUESDAY 30<sup>TH</sup> MARCH 2010 (9.35 TO 10.35)

##### Refrigerants & refrigeration in the future

Diamond Room, Chairman Andy Pearson

9.35	Reducing the environmental impact of refrigeration: an Ineos Fluor perspective R Low	244
9.55	Sustainable refrigerant selection in binary blends of the R1234yf – hydrofluoroethers S Artemenko, D Nikitin, S Haddad, V Mazur	204
10.15	F-gas containment - two UK led projects on reducing refrigerant emissions & leakage D Cowan, I Chaer, G Maidment	251

##### Food quality, safety and microbiology

Chadwick Room, Chairman Jacques Guilpart

9.35	Growth potential of listeria monocytogenes in salted diced bacon A Beaufort, H Bergis, P Garry	189
9.55	Chilling individual retail pots of hot-filled soups and sauces using air to meet cook-chill guidelines C James, C Bobst, H Fleury, S Palpacelli and S James	207
10.15	Possible use of negative ions and ozone as anti bacteria mixture G Panozzo, L Fedele, M Franceschi, S Rossi	217

##### Modelling & predictive tools

Tower Room, Chairman Monica Axell

9.35	Theoretical analysis of the coupling of heat and mass transfer of fruits and vegetables in precooling L Bin, C Jinghui, H Yanhong, Y Xingying	195
9.55	Thermal modelling of catering meals under blast-cooling J Rabi, J Guilpart, E Derens, A Duquenoy	261

**10.35 to 10.55 COFFEE BREAK**, Dining Room and Diamond Room

#### PAPERS SESSION 2 - TUESDAY 30<sup>TH</sup> MARCH 2010 (11.00 TO 1.00)

##### Refrigerants & refrigeration in the future

Diamond Room, Chairman Andy Pearson

11.00	Lubricating the Future of Refrigeration – CO <sub>2</sub> : Effective Lubrication of Carbon Dioxide Refrigeration Systems R Rogers	222
11.20	Using natural refrigerants in the cold chain A Pachai, M Jones	223

11.40	Ammonia a safe refrigerant? L Rolfsman	226
12.00	Use of carbon dioxide for air conditioning and general refrigeration SF Pearson	225
12.20	Sensitivity of TEWI estimate – leakage and energy for CO <sub>2</sub> as refrigerant in commercial refrigeration R Islam	174

### Innovation in storage & transportation

Chadwick Room, Chairman Robert Heap

11.00	Usefulness and subtlety of the overall coefficient of heat transfer in cooling containers G Labranque, A Kacimi	170
11.20	Cryogenic refrigerated transport equipments tests: methodology and results G Cavalier, Ph Nol, N Valentin and B Amara	171
11.40	Dynamic simulation of the refrigerated compartment of a truck coupled with its refrigeration system A Rachek, V Sartre, J Bonjour	172
12.00	Energy consumption reduction in marine refrigerated containers R Lawton, T Mynott, N Marshall	231
12.20	Influence of mass-flow injection ratio on an economised indirect multi-temperature transport refrigeration system S Smyth, D Finn, B Brophy	194
12.40	Evaluation of secondary coolants in multi-temperature indirect refrigeration systems for transport applications S Smyth, D Finn, B Brophy	196

### Energy efficiency in food & pharmaceuticals

Tower Room, Chairman Don Cleland

11.00	Reducing energy consumption in cold storage rooms J Evans, A Gigiel	184
11.20	Energy use across supermarket refrigeration J Lawrence, D Gibson	242
11.40	Bread freezing and storage. Impact of process condition on energy demand A le Bail, T Dessev, V Jury, T Park and R Zuniga	239
12.00	Improving the energy efficiency of food refrigeration operations throughout the cold chain S James	209
12.20	The energy saving potential of ambient cooling systems S James, Y Senso, C James	210
12.40	Distribution of superchilled meat A Stevik, A Hemmingsen, E Indergård, T Nordtvedt	180

1.00 to 1.55 LUNCH, dining room

### PAPERS SESSION 3 - TUESDAY 30<sup>TH</sup> MARCH 2009 (2.00 TO 4.00)

#### Innovation in process & equipment design

Diamond Room, Chairman Graeme Maidment

2.00	Improved efficiency and real time temperature monitoring in the food supply chain G Ólafsdóttir, S Bogason, C Colmer, M Eden, T Hafliðason, M Kück	253
2.20	Packaged ammonia chillers in the cold chain R Lamb, A Pearson	247
2.40	Potential interest of electric field during food freezing; a review of electrofreezing A Le-Bail, M Orłowska, M Havet	240
3.00	Air cycle combined heating and cooling for the food industry A Foster, T Brown, A Gigiel, J Evans	185
3.20	The use of NH <sub>3</sub> and CO <sub>2</sub> heat pumps in food processing plants with cold storage facilities K Visser	190
3.40	Feasibility of using vascular perfusion chilling for red meat carcasses T Brown, J Evans	186

#### Advances in commercial refrigeration

Chadwick Room, Chairman Guy Hundy

2.00	Ecodesign of refrigeration products S Mudgal, J Bain, M Liput	200
2.20	Theoretical evaluation of integrated systems for refrigeration and air conditioning in supermarkets L Cecchinato, M Corradi, E Fornasieri, S Minetto	202

2.40	Integration of CO <sub>2</sub> refrigeration and trigeneration systems for supermarket applications IN Suamir, S Tassou, A Hadawey, D Marriott	203
3.00	A R744 transcritical system with heat recovery for a supermarket - a case study I Colombo, L Jordan, G Maidment, I Chaer, J Missenden	206
3.20	Performance optimization of a secondary refrigerant display cabinet using tests and CFD modeling A Hadawey, S Tassou, IN Suamir, H Jouhara	214
3.40	Reducing the wastage of fresh fruit and vegetables by consumers N Hipps, D Johnson, S Hails, J Evans	256

### Food quality, safety and microbiology

Tower Room, Chairman Silvia Estrada Flores

2.00	Superchilling, ice fraction and quality A Stevik, A Hemmingsen, A Duun, H Walnum, T Nordtvedt	181
2.20	Experimental study on vacuum freeze-drying of <i>hylocereus undatus</i> T Zou, S Ma, B Liu, X Yi	197
2.40	The effect of freezing and end cooking temperature on the eating quality of beef steaks C James, D Briggs, S James	211
3.00	Time Temperature Integrators for shelf life monitoring and optimization and risk reduction in the food chill chain: application on map minced beef P Taoukis, T Tsironi, M Giannoglou, I Metaxa, E Gogou	230
3.20	Guaranteeing food quality in the food chain for imported meat products J Bowater	254
3.40	Regression equations for heat load and weight loss during beef chilling QT Pham, F Trujillo, L Davey, N McPhail	168

4.00 to 4.25 COFFEE BREAK, Dining Room and Diamond Room

### PAPERS SESSION 4 - TUESDAY 30<sup>TH</sup> MARCH 2010 (4.30 TO 6.10)

#### Innovation in storage & transportation

Diamond Room, Chairman Savvas Tassou

4.30	Developments in active and passive refrigerated transportation for the pharmaceutical industry M Miller, A Mistry, R Lawton, T Mynott	232
4.50	The potential for super-cooled storage of vegetables and fruits C James, V Seignemartin, N Salaun, S Costa, B Nanthieras and S James	208
5.10	Air leakage and heat leakage in insulated road transport equipment L Lukasse, M Staal	216
5.30	Experimental evaluation of optical absorption coefficient of insulated vehicle sandwich panel at the sun radiation G Panozzo, A Dragano, S Rossi, M Franceschi, P Bison	218
5.50	Modeling and experimental investigation of a transportation refrigeration system J Mun, K Choi, M Rifaldi, J Oh,	188

#### Modelling & predictive tools

Chadwick Room, Chairman Alan Foster

4.30	A model to evaluate refrigerated cabinet designs for energy efficiency R Love, D Cleland	191
4.50	Annex 31: Advanced modeling and tools for analysis of energy use in supermarket systems J Arias, P Lundqvist, S Sawalha, M Axell	192
5.10	An interactive refrigeration system simulator software I Eames, T Brown, G Maidment, J Missenden, J Evans, M Swain and S James	246
5.30	Performance evaluation and design optimization of refrigerated display cabinets through fluid dynamic analysis G Artico, S Mousset, D Fortini	205

#### Innovative technologies for process equipment design

Tower Room, Chairman Judith Evans

4.30	Generic data for the performance of alternative insulation systems measured over the temperature range -160 to +20°C B Crunkhorn, P McDonald	248
4.50	Optimal configuration and energy conservation of condensers based on part load J Zhang, Y Xu	193
5.10	Development of solar thermal heating and cooling systems using the jet pump cycle R Fenton, S Knowles, I Eames and G Maidment	258

5.30	A review of “pumpless” absorption refrigeration cycles A Paurine, G Maidment, I Eames, J Missenden	233
5.50	Waste heat driven MAC Z Tamainot-Telto, S Metcalf, R Critoph	260

## 6.10 CLOSE OF DAY 2

### 6.30 to 7.30 Commission Meetings

D2 refrigerated transport commission in the Chadwick Room

**7.15 PRE DINNER RECEPTION**, sponsored by Nanopore Insulation Ltd in the Senior New Common Room

**8.00 CONFERENCE DINNER**, Dining Hall

## DAY 3 – WEDNESDAY 31ST MARCH 2010

<b>Short courses 9.30 to 12.30</b>	<b>Technical Tours, various departure times from outside main entrance in Grange Road. Coaches will depart promptly</b>
<b>Mathematical modeling</b> Tower Room, Chairman Bart Nicolai Speakers: Don Cleland, Massey University, New Zealand, Bart Nicolai, BIOSYST-MeBioS, Belgium, Alan Foster, London South Bank University and R&DT, Annemie Geeraerd, BIOSYST-MeBioS, Belgium	<b>Commercial cooling and refrigerated transport equipment manufacturing facility,</b>  Hubbard Products Ltd <b>Coach departs at 8.00</b>
<b>Temperature control and energy efficiency in the cold chain</b> Chadwick Room, Chairman Silvia Estrada-Flores Speakers: David Pearson, Star Refrigeration, UK, Prof Don Cleland, Massey University, New Zealand, Silvia Estrada-Flores, Food Chain Intelligence, Australia, Judith Evans, London South Bank University and R&DT, UK, Stephen James, the Grimsby Institute, UK.	<b>Energy efficient two-stage ammonia cold store and chill application,</b>  Kuehne and Nagel <b>Coach departs at 8.15</b>
<b>Alternative technologies review and action workshop</b> Diamond Room, Chairman Graeme Maidment Speakers: Andrew Gigiel, CCC Consulting, UK, Stephen Knowles, UK, Industrial Design Consultancy Limited Graeme Maidment, London South Bank University, UK, Neil Mathur, University of Cambridge, UK Z. Tamainot-Telto, University of Warwick, UK, Savvas Tassou, Brunel University, UK Neil Wilson, Camfridge Ltd, UK	<b>Carbon Dioxide Transcritical refrigerating system at a zero carbon supermarket,</b>  Tesco Stores Ltd <b>Coach departs at 9.00</b>

**12.30 to 1.20 LUNCH**, dining room

### 1.25 PLENARY SESSION IN DIAMOND ROOM

Chairman Graeme Maidment

1.25 Towards a sustainable cold chain from D Cleland, Head of the School of Engineering and Advanced Technology Massey University

1.55 Introduction to the Co-operative Research Programme, Biological Resource Management for Sustainable Agricultural Systems from Janet Schofield, theme co-ordinator Organisation for Economic Co-operation and Development

### PAPER SESSION 5 – WEDNESDAY 31ST MARCH 2010 (2.10 TO 3.50)

#### Sustainable retail refrigeration

Diamond room, Chairman Radim Cermak

2.10	Evaluation of energy savings by heat recovery from refrigeration plants in supermarkets G Cortella, O Saro	176
2.30	Concurrent refrigeration passive defrost to control meat surface temperature in open refrigerated display cabinet R Islam	177

2.50	Performance of retail and commercial refrigeration systems J Evans, M Swain	183
3.10	Controlling noise of refrigeration equipment in neighbourhood retail S Lamy, P Poysat	198
3.30	Vertical display cabinets with and without doors - a comparison of measurement in laboratory and in supermarket U Lindberg, M Axell, P Fahlén	219

### Modelling & predictive tools

Chadwick Room, Chairman Tuan Pham

2.10	Prediction of thermal conductivity for frozen foods with air voids J Wang, J Carson, J Willix, M North, D Cleland	173
2.30	Temperature prediction in domestic refrigerator: determinist and stochastic approaches O Laguerre, D Flick	178
2.50	Investigation of heat pump seasonal efficiency using a computation model G Hundy, E Winandy	234
3.10	Novel design and performance of domestic refrigerators C Marques, G Maidment, G Davies, J Evans, I Wood	229
3.30	Optimization of chicory root cold store humidification system using computational fluid dynamics M Delele, A Schenk, B Nicolai, P Verboven	250

### Innovative technologies for process & equipment design

Tower Room, Chairman Andrew Gigiel

2.10	Development of a micro cooling probe for brain mapping S Mahmoud, R Al-Dadah, D Aspinwall, S Soo	221
2.30	Groundwater system with heat pumps saves 70% of energy H Winther, M Klootwijk	238
2.50	District heating, district cooling and desalination using ammonia heat pumps D Pearson	255
3.10	Alternative geothermal heating sources, heat pumps and their application J Thompson, G Maidment	235
3.30	Numerical analysis of a plate fin and tube evaporator using the natural refrigerant CO <sub>2</sub> J Shilliday, S Tassou	259

3.50 to 4.10 **COFFEE BREAK**, Dining Room and Diamond Room

## PAPER SESSION 6 – WEDNESDAY 31ST MARCH 2010 (4.15 TO 5.15)

### Sustainable retail refrigeration

Diamond Room, Chairman Issa Chaer

4.15	Energy-efficient laminar flow heat exchangers indirectly cooled display cabinets - reduced use of energy and improved temperature quality of the provisions C Haglund Stignor, M Axell	220
4.35	Performance evaluation and control optimization of a CO <sub>2</sub> booster refrigeration system in supermarket Y Ge, S Tassou	237
4.55	Development of a design tool for recirculated air curtains used on retail display cabinets E Hammond, J Evans, A Foster	252

### Developments in packaging

Chadwick Room, Chairman Robert Heap

4.15	Proposal for determining the thermal rating of insulated packages intended for the transport of perishables A Sharp, E Orszulok	236
4.35	The rate of moisture sorption by packaging in the cold chain J Bronlund, D Cleland, S MacKay, T Elsten	224
4.55	Low emissivity food packaging for more efficient refrigeration and carbon saving G Davies, G Maidment, D Man, D Andrews, N Jia, M Hutchins	228

### Carbon foot printing & assessment methodologies

Tower Room, Chairman Graeme Maidment

4.15	Carbon footprint of ready-made chilled meals N Espinoza Orias, H Stichnothe, A Azapagic	241
4.35	Estimation of CO <sub>2</sub> emission from the transportation process of mackerel in Japan M Watanabe, A Suzuki, H Komaki, K Osako, T Suzuki	179

4.55	Measurement and simulation of energy consumption of transport refrigeration equipments G Cavalier, A Stumpf	215
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**5.20 CLOSING SESSION**

- Diamond Room, Chairman Andy Pearson
- 5.20 Sustainable technology development and influencing policy from Andy Pearson, President Elect, Institute of Refrigeration

**5.35 CONFERENCE ENDS**

