



# CARBON IMPRINT FOR THE COLD STORAGE INDUSTRY

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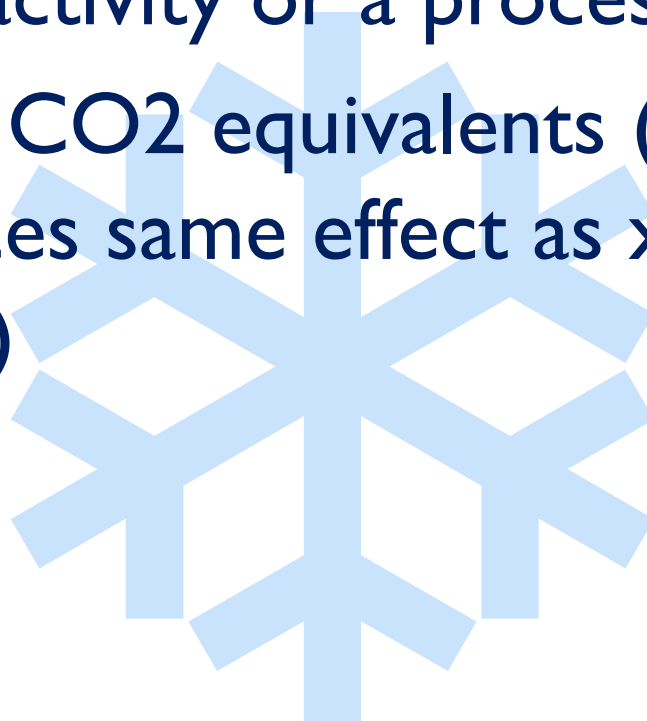
# ECSLA

## European Cold Storage and Logistics Association

- 49 M m<sup>3</sup> accross Europe
  - National Associations
  - Corporate Members
- Service providers in temperature controlled logistics
- Based in Brussels

# CARBON FOOTPRINT

- Sum of greenhouse gas (GHG) emissions linked to an activity or a process
- Expressed in CO<sub>2</sub> equivalents (CO<sub>2</sub>e), (1 kg of GHG produces same effect as x kgs of CO<sub>2</sub> after 100 yrs)



# CARBON FOOTPRINT OF COLD STORAGE

The cold chain is estimated to be responsible for approximately 2.5% of global greenhouse gas emissions through

Indirect effect  
(energy consumption)

Direct effects  
(leakage of refrigerant  
GHGs)

# ENVIRONMENTAL IMPACT OF INEFFICIENT SYSTEMS

Increased power consumption (and costs)



Increased CO<sub>2</sub> emissions from power plants



# ENVIRONMENTAL IMPACT OF REFRIGERANTS

ODP  
(Ozone Depletion Potential)

Chloro**Fluoro**Carbons (CFC) (R11,  
R12, R502)

GWP  
(Global Warming Potential)

Hydro**ChloroFluoro**Carbons (HCFC)  
(R22)

Hydro**Fluoro**Carbons (HFC) (R134a,  
R404A, R407C ou R410A)

# IMPACT OF REFRIGERANTS ON OZONE AND CLIMATE

Refrigerant	ODP	GWP
CFC R12	1	8 500
HCFC R22	0,055	1700
HFC R134a	0	1300
HFC R404A	0	3 800
NH3	0	0
CO2	0	1

# WHY REDUCE CARBON FOOTPRINT OF COLD STORES?

- Regulatory context (Montreal and Kyoto Protocols)
- “Self-regulation”
  - Greening of the supply chain
  - Listed companies have obligation to audit emissions
  - Corporate Social Responsibility
- Cost savings (e.g. energy and refrigerant costs)



# REGULATORY FRAMEWORK: MONTREAL & KYOTO PROTOCOLS

- Montreal Protocol (1987) – protection of the ozone layer
  - ➔ EU 2037/2000 – revised by EU 1005/2009
    - ➔ Progressive reduction of production
    - ➔ Progressive phase out
- Kyoto Protocol (1997 - 2012) – against global warming
  - ➔ EU 842/2006 (F-gas) – to be revised by 2011
    - ➔ containment
    - ➔ certification of companies and personnel

# POST-KYOTO

- International negotiations on HFCs
  - Copenhagen in 2009
  - Cancun in 2010
- Include HFCs in Montreal Protocol?
  - Phase out?



# WHICH TOOL?

Many different tools for quantifying the environmental impact of refrigeration systems, one of the most energy-intensive technologies used in the food supply chain:

- TEWI (Total Equivalent Warming Impact)
- LCCP (Life-Cycle Climate Performance)
- LCA (Life Cycle Analysis)
- ...

# TOWARDS A COMMON EU METHODOLOGY?

The Council of EU has invited the Commission:

- To study the possibility of introducing the carbon footprint of products in the existing EU environmental labelling instruments; and,
- To start working on common voluntary methodologies facilitating the future establishment of carbon assessments.

**But, no commonly agreed methodology exists** to date at EU or international level: self-regulation and voluntary standards are used

# HOW TO REDUCE CARBON FOOTPRINT OF REFRIGERATION?

- Improve energy consumption
- Revert to natural refrigerants



# IMPROVE ENERGY EFFICIENCY

- Close monitoring of
  - The refrigeration system
  - The procedures (door openings, regular defrosting, nightly pull down for lower energy rates, ...)
  - The equipment (adaptability of freezing tunnels, ..)
- Unnecessary °C are expensive (in food, every °C < - 18°C → 5% extra energy)

# NH<sub>3</sub>: MINIMAL DIRECT & INDIRECT EFFECTS

- Natural refrigerant ammonia (NH<sub>3</sub>) is the **most common** refrigerant used in industrial refrigeration
- **15-20% energy savings** in comparison to HFC and HCFC systems
- **GWP<sub>NH<sub>3</sub></sub> = 0 - ODP<sub>NH<sub>3</sub></sub> = 0**
- In **smaller cold stores or for >0°C**, NH<sub>3</sub> is technically feasible, but not as widely deployed

# NH<sub>3</sub>: MINIMAL DIRECT & INDIRECT EFFECTS

The use of NH<sub>3</sub> in different countries is much influenced by local safety regulations

- **Germany/Spain:** In 2009, over 80% of refrigeration plants are cooled with ammonia, about 16% were HFC-based, while 2% use CO<sub>2</sub> and less than 1% R22.
- **France / Holland:** HCFC R22 is widespread (close to 50 %). Safety regulations applicable to small and average systems using ammonia have been updated. The uptake of ammonia is likely to increase.



# USE OF CO2 SECONDARY FLUID FOR INCREASED SAFETY

NH3 would be the first choice for most cold stores, but if not permitted by the authorities, the next best thing can be the NH3/CO2 fluid solution:

- **NH3/CO2:** An NH3 refrigeration system using natural refrigerant CO2 as secondary fluid can provide **energy savings of up to 20%** compared to a water-based brine/glycol.
- **GWP<sub>CO2</sub> = 1**
- **NH3 refrigerant confined in machinery room**
- **Reduced NH3 refrigerant charge**

# CONCLUSION

- Cargon footprinting
  - Not yet mandatory
  - Not yet harmonised
- In the interest of
  - Companies
  - the Environment

