

COLD CHAIN TECHNOLOGY BRIEF

COLD STORAGE AND REFRIGERATED WAREHOUSES

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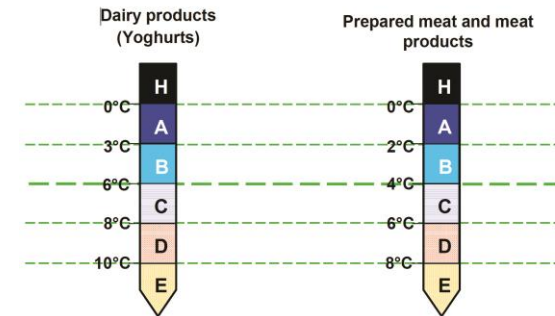
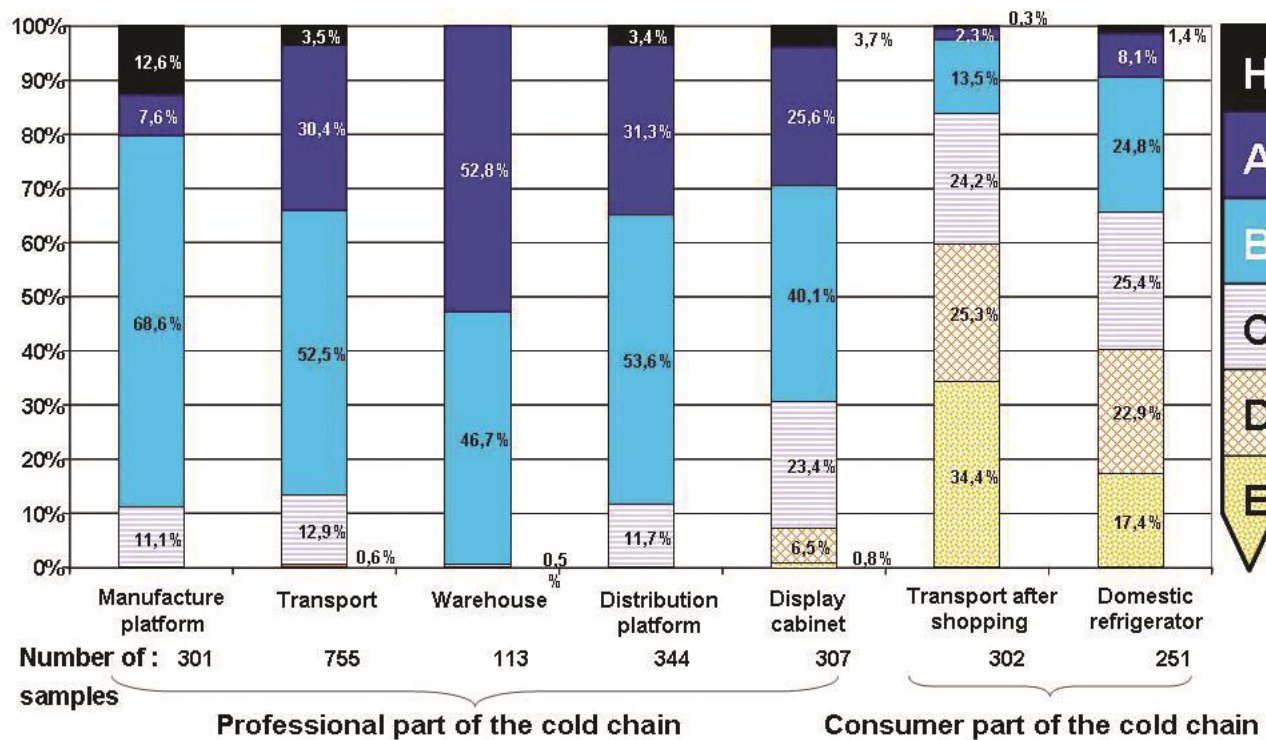
Cold storage warehouses

- ~600 million m³ worldwide
- Chilled -1 to 12°C
- Frozen <-10°C (lowest temperature for microbial growth)
- 10-20 m³ to thousands of m³



Cold storage warehouses

- Generally well controlled sector of cold chain



Derens, E., Palagol, B., Cornu, M., Guilpart J., 2007. The food cold chain in France and its impact of food safety. IIR ICR2007, Beijing, China.



Cold storage warehouse issues

- Direct emissions
 - Refrigerants – generally low GWP refrigerants such as ammonia (R717) in large plant
 - Some evidenced move to other refrigerants in Article 5 countries due to safety concerns
 - Smaller plant HFC, HFO refrigerants
 - Leakage ~ 8%/year
 - Indications that may be 2x as high in developing countries



Cold storage warehouse issues

Why is GWP important?

Ammonia

CO₂

Air

<1

1

•

•

< trip for 2 to local shops in small family car (1 mile)

= trip for 2 to supermarket in small family car (10 miles)

Typical HFC

3900

= 1.52 times around the earth in small family car (37,864 miles)

CO₂ used as baseline



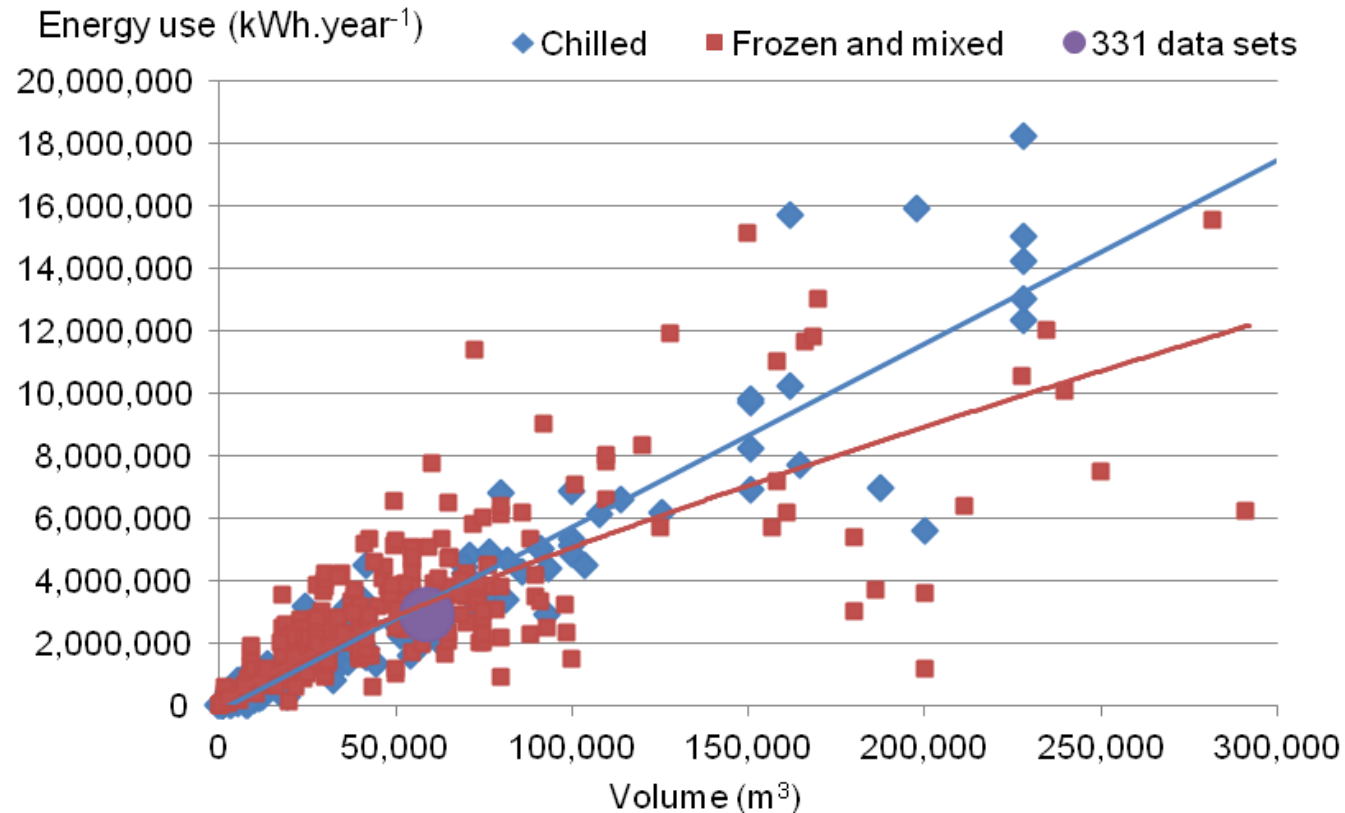
Cold storage warehouse issues

- Indirect emissions
 - Energy use
 - 60-70% of electrical energy in cold storage facility can be used for refrigeration
 - Large range in energy use
 - Energy savings of 30-40% typically can be achieved



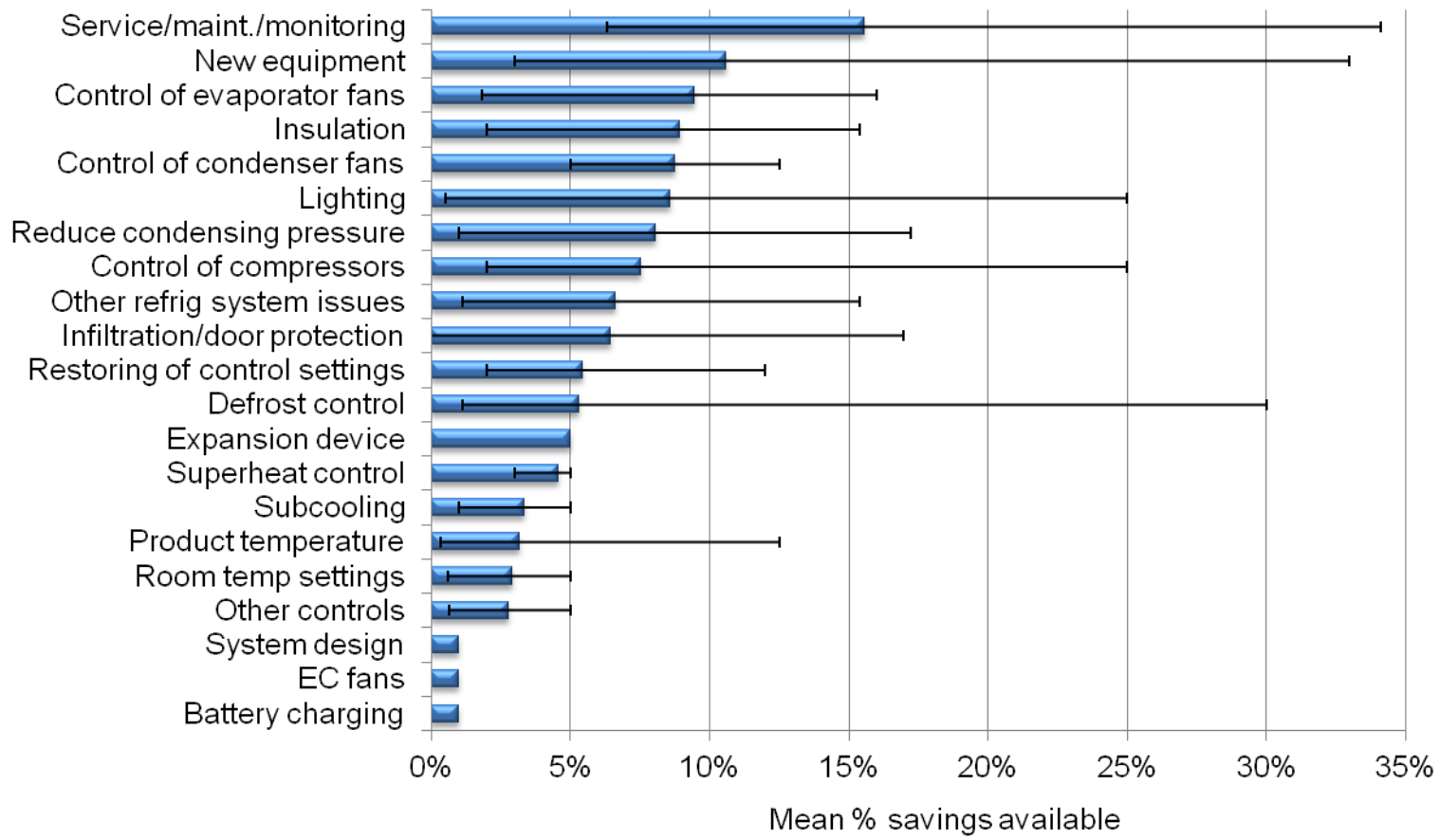
Cold storage warehouse issues

Energy use



Cold storage warehouse issues

Energy savings



Perspectives and challenges

- Many options to reduce emissions (especially indirect)
- Direct emissions traditionally low, care needed to ensure new systems have low GWP refrigerants
- Training, maintenance often an issue (plus safety)
- Potential for novel refrigeration systems low in large systems
- But potential for CHP, poly/tri generation
- Potential for better integration to reclaim heat, integrate with renewable energy resources



Thank you for your attention

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