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Where is the greatest potential for energy saving?

defra
Department for Environment Food and Rural Affairs

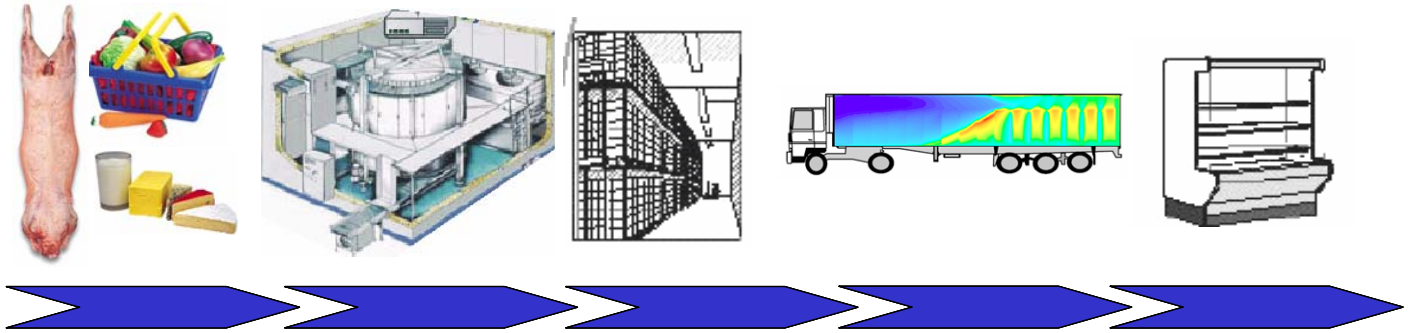
University of BRISTOL
Food Refrigeration & Process Engineering Research Centre

Brunel UNIVERSITY WEST LONDON

LONDON SOUTH BANK UNIVERSITY

University of Sunderland

Energy mapping - refrigeration



	Chilling	Freezing	Thawing Tempering	Secondary cooling	Chilled Storage	Frozen Storage	Transport	Retail	Catering
Energy used									
Throughput									
Energy change in food									
Efficiency									
Energy that could be saved									

Energy mapping – top ten ranking

1	Retail display
2	Catering – kitchen refrigeration
3	Refrigerated transport
4	Cold stores
5	Blast chilling – ready meals, pies, etc
6	Blast freezing – potato products, etc
7	Dairy processing – milk/cheese
8	Milk cooling – raw milk on farm
9	Potato storage – bulk raw potatoes
10	Primary chilling – meat carcasses

1 - Retail display

- 5,768 to 12,698 GWh/y
- Data sources
  - Market Transformation Programme
  - FRPERC test data
- Estimate of cabinets in use - agreement
- Average energy consumption - variable

2 - Catering – kitchen refrigeration

- 3,998 to 4,762 GWh/y
- Data sources
  - Market Transformation Programme
  - FRPERC test data
- Commercial service cabinets
- Walk-in cold rooms

3 - Refrigerated transport

- 4,822 GWh/y
- Data sources
  - Cold Storage & Distribution Federation
  - Brunel University - Savvas Tassou
- 52,000 refrigerated vehicles in use
- Average 26 litres/day for refrigeration

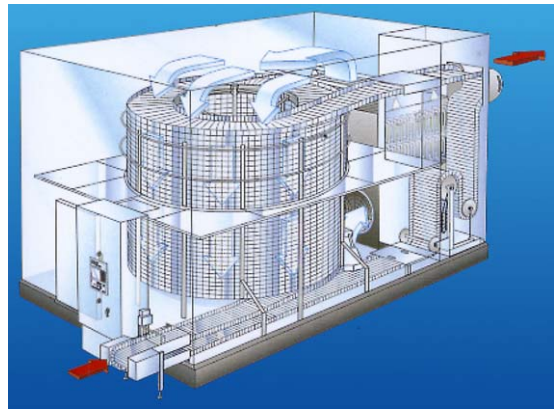
4 - Cold stores

- 900 GWh/y
- Data sources
  - Cold Storage & Distribution Federation
  - Carbon Trust
- Based on 2004 benchmarking exercise
- 200 primary cold store sites
- 9.65 million cubic metres capacity
- New study updating data

5 - Blast chilling

- 250 to 600 GWh/y
- Data sources
  - Market survey data 1.2m tonnes
  - Food & Drink Federation data
- Cooling of (hot) products most energy
  - Ready meals
  - Pies
  - Pizzas etc.
- Lack of process benchmarking data

6 - Blast freezing



- 218 to 415 GWh/y
- Data sources
  - Market survey data 3.2 m tonnes
  - British Frozen Food Federation
- Blast freezing of products
  - Processed potato - 1 m tonnes
  - Ice cream
  - Vegetables
- Benchmark data 70 to 133 kWh/tonne

7 - Dairy processing - milk/cheese

- 250 GWh/y
- Data sources
  - Dairy UK
  - Milk Development Council
- Dairy processing
  - Milk pasteurisation/cooling - 6.9 m tonnes
  - Cheese production - 0.39 m tonnes
- Milk published benchmark 20 kWh/tonne

8 - Milk cooling - raw milk on farm

- 99 to 315 GWh/y
- Data sources
  - Dairy UK
  - Milk Dev Council / Farm Energy Centre
  - US energy efficiency study
- 14.6 m tonnes raw milk cooled 37 to 4ºC
- 6.8 to 21.6 kWh/tonne measured

9 - Potato storage - bulk raw

- 144 to 187 GWh/y
- Data sources
  - British Potato Council
  - UK study – Devres & Bishop
- 71.8 to 93.4 kWh/tonne cooling/storage
- 6 m tonnes/y - estimated 2 m refrigerated

10 - Primary chilling - meat carcasses

- 115 to 144 GWh/y
- Data sources
  - Production data / Defra, FAO
  - FRPERC measured data
- 3.39 m tonnes meat production
- Measured mean of 34 kWh/tonne beef
- Measured mean of 42.5 kWh/tonne pork

Energy mapping – top ten ranking

		GWh/y	% saving	GWh/y
1	Retail display	5,768 to 12,698	30-50	2307 to 5079
2	Catering – kitchen refrigeration	3,998 to 4,762	30-50	1599 to 1904
3	Refrigerated transport	4822	20-25	1085
4	Cold stores	900	20-40	270
5	Blast chilling – ready meals, pies, etc	250 to 600	20-30	62.5 to 150
6	Blast freezing – potato products, etc	218 to 415	20-30	55 to 104
7	Dairy processing – milk/cheese	250	20-30	62.5
8	Milk cooling – raw milk on farm	99 to 315	20-30	25 to 79
9	Potato storage – bulk raw potatoes	144 to 187	~30	43 to 56
10	Primary chilling – meat carcasses	115 to 144	20-30	29 to 36