

Appendix 7: Storage

Energy use given as process energy, no inclusion of conversion losses or production and delivery energy.

1. Cold storage**Table 1.1 Cold storage in households**

Product/appliance	Country	Source	Comment	Electricity use, MJ	Unit
Meat, refrigerator	Sweden	Olsson, 1997, p. 9	Ref. from 1995	0,0200	per kg, day
Refrigerator	Denmark	Weidema, 1995, p. 133	Data for 1992, 50 % utilisation	0,0341	per litre, day
Refrigerator	Sweden	Andersson, 1999, p. 10, paper II	Ref. from 1995, 100% utilisation	0,017	per litre, day
Average refrigerator	Switzerland	BAK, 1992, p. 234	Ref. year 1990	0,019	per litre net volume, day
"Best value" refrigerator	Switzerland	BAK, 1992, p. 234	Ref. year 1991, lowest temp. -6°C, Volume 150l	0,013	per litre net volume, day
"Best value" refrigerator	Switzerland	BAK 1992, p. 234	Ref. year 1991, lowest temp. -6°C, Volume 250l	0,011	per litre net volume, day
"Best value" refrigerator	Switzerland	BAK 1992, p. 234	Ref. year 1991, lowest temp. -18°C, Volume 150l	0,016	per litre net volume, day
"Best value" refrigerator	Switzerland	BAK 1992, p. 234	Ref. year 1991, lowest temp. -18°C, Volume 250l	0,013	per litre net volume, day
"Best value" freezer	Switzerland	BAK 1992, p. 235	Ref. year 1991, upright freezer, Volume 150l	0,021	per litre net volume, day
"Best value" freezer	Switzerland	BAK 1992, p. 235	Ref. year 1991, upright freezer, Volume 250l	0,011	per litre net volume, day
"Best value" freezer	Switzerland	BAK 1992, p. 235	Ref. year 1991, freezer chest, Volume 250l	0,008	per litre net volume, day
"Best value" freezer	Switzerland	BAK 1992, p. 235	Ref. year 1991, freezer chest, Volume 350l	0,007	per litre net volume, day
Average freezer	Switzerland	BAK 1992, p. 236	Ref. year 1991, upright freezer	0,026	per litre net volume, day
Average freezer	Switzerland	BAK 1992, p. 236	Ref. year 1991, freezer chest	0,012	per litre net volume, day

Table 1.2 Cold storage in households, theoretical values based on producer information

Product	Country	Source	Comment	Electricity use, MJ	Unit
Refrigerator, Electrolux, new A-class	-	Retailer, Sweden, 1999	Net volume 306 l	0,0049	per litre net volume, day
Refrigerator, Electrolux, new B-class	-	Retailer, Sweden, 1999	Usable volume 378 litre	0,006	per litre net volume, day
Refrigerator, 10 years old, average	-	Retailer, Sweden, 1999	Twice as much as todays B-class refrigerator	0,013	per litre net volume, day
Freezer, Electrolux, new A-class	-	Retailer, Sweden, 1999	Usable volume 228 l	0,012	per litre net volume, day
Freezer, Electrolux, new B-class	-	Retailer, Sweden, 1999	Usable volume 290 l	0,015	per litre net volume, day
Freezer, 10-years old, average	-	Retailer, Sweden, 1999	Twice as much as todays B-class freezer	0,029	per litre net volume, day

Table 1.3 Cold storage in restaurants, industries etc.

Product/appliance	Country	Source	Comment	Electricity use, MJ	Unit
Apples, long-term storage, refrigerated	Sweden	Stadig, 1997, p. 37	Data for 1997	0,0017	per kg, day
Apples, long-term storage, refrigerated	France	Stadig, 1997, p. 67	Data for 1997	0,0009	per kg, day
Food in general, cool room	-	Enquete Commission 1994, Anhang 4, Studie J, p. 15	Cool room	0,0025	per litre net volume, day
Food in general,central store, refrigerator	Sweden	Johannisson och Olsson, 1997, p. 11	Ref. from 1996, storage time unknown	0,1300	per kg product sold
Food in general, central store, freezer	Sweden	Naturvårdsverket, 1997b, p. 97	-	0,0011	per kg, day
Food in general, wholesaler, freezer	Sweden	Naturvårdsverket, 1997b, p. 97	-	0,0025	per kg, day
Food in general, retailer, refrigerator	Sweden	Johannisson och Olsson, 1997, p. 11	Ref. from 1996, storage time unknown	0,70	per kg product sold
Food in general, retailer, freezer	Sweden	Naturvårdsverket, 1997b, p. 97	-	0,18	per kg, day
Food in general, restaurant, freezer	Sweden	Naturvårdsverket, 1997b, p. 97	-	0,043	per kg, day
Food in general,freezer warehouse	-	BELF 1983, p.200	Room 10 000 m3	0,0010	per litre net volume, day
Food in general, freezer warehouse	-	BELF 1983, p.200	Room 1000 m3	0,0020	per litre net volume, day
Food in general, freezer warehouse	-	BELF 1983, p.200	Room 100 m3	0,0059	per litre net volume, day
Food in general, freezer warehouse	-	BELF 1983, p.200	Room 10 m3	0,015	per litre net volume, day
Food in general, retailer, freezer	-	BELF 1983, p.200	-	0,069-0,15	per litre net volume, day
Cream, fresh, retailer, refrigerator	Sweden	Lorentzon et al, 1997, p. 52	Data for 1997, storage time 0,7-1,9 days	0,031	per kg product sold

Table 1.3: Cold storage in restaurants, industries etc. continued....

Orange juice, retailer, refrigerator	Sweden	Lorentzon et al, 1997, p. 62	Data for 1997, storage time 1,9-14 days	0,23	per kg product sold
Meat balls, retailer, refrigerator	Sweden	Lorentzon et al, 1997, p. 63	Data for 1997, 350 g, storage time 2,5-12,5 days	2,2	per kg product sold
Meat balls, retailer, freezer	Sweden	Lorentzon et al, 1997, p. 71	Data for 1997, 1000 g, storage time 9-18 days	1,7	per kg product sold
Meat balls, retailer, freezer	Sweden	Lorentzon et al, 1997, p. 40, 73	Data for 1997, 300 g, storage time 25 days	3,5	per kg product sold
Meat, central store, refrigerator	Denmark	Weidema, 1995, p. 133	Ref. from 1994. 25 % utilisation	0,0010	per litre, day
Meat, central store, refrigerator	Sweden	Olsson, 1997, p. 9	Ref. from 1995	0,0030	per kg, day
Meat, retailer, cold store	Denmark	Weidema, 1995, p. 133	Ref. from 1994, 25 % utilisation	0,0010	per litre, day
Meat, retailer, cold counters	Denmark	Weidema, 1995, p. 133	Ref. from 1994, 80 % utilisation	0,055	per litre, day
Meat, retailer, cold racks	Denmark	Weidema, 1995, p. 133	Ref. from 1994, 50 % utilisation	0,0597	per litre, day
Meat, retailer, refrigerator	Sweden	Olsson, 1997, p. 9	Ref. from 1995	0,030	per kg, day
Meat, retailer, cold racks	Sweden	Carlsson-Kanyama, 1998, p. 30	data for 1994, 15 kg meat/m ² cold racks, energy for heating, ventilation incl.	0,88	per kg, day, mostly electricity
Vegetables and fruit, cold room	-	Enquete Commission 1994, Anhang 4, Studie J, p. 15	Cool room: higher energy requirements because of respiration	0,0029	per litre net volume, day

Table 1.4: Cold storage in restaurants, industries: theoretical values based on producer information

Appliance	Country	Source	Comment	Electricity use, MJ	Unit	Electricity use, MJ	Unit
Refrigerator, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 440 litre, 0,42 kW	0,041	per litre net volume, day	0,0550	per litre, day, 75 % load
Refrigerator, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 600 litre, 0,52 kW	0,0374	per litre net volume, day	0,0499	per litre, day, 75 % load
Refrigerator, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 1200 litre, 0,61 kW	0,022	per litre net volume, day	0,0293	per litre, day, 75 % load
Refrigerator, 10 years old, average	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Double energy use of new equipment	-	-	-	-
Freezer, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 440 l , 0,51 kW	0,067	per litre net volume, day	0,0742	per litre, day, 90 % load
Freezer, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 600 l, 0,58 kW	0,056	per litre net volume, day	0,0619	per litre, day, 90 % load
Freezer, Electrolux, new	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Usable volume 1200 l , 0,73 kW	0,035	per litre net volume, day	0,0389	per litre, day, 90 % load
Freezer, 10-years old, average	-	Electrolux, Sweden, 1999, Ulf Andreasson, pers. comm.	Double energy use of new equipment	-	-	-	-
Cold racks, retailer	Sweden	Electrolux, Sweden, 1999, Erik Ringius, pers. comm.	Todays average equipment	0,12	per litre net volume, day	0,1644	per litre, day, 75 % load

2. Storage in room temperature

Table 2.1. Storage in households: theoretical values based on producer information

Product	Country	Source	Comment	Energy used, MJ	Unit
Food	Sweden	Swedish National Energy Administration, 1999, Thomas Bergren, pers. comm.	Energy for heating newly built single-family dwellings, 288 MJ/m ² , year	0,00033	per litre, day
Food	Sweden	Swedish National Energy Administration, 1999, Svante Wik, pers. comm.	Energy for todays average single-family dwellings, 540 MJ/m ² , year	0,00064	per litre, day
Food	Sweden	Swedish National Energy Administration, 1999, Thomas Bergren, pers. comm.	Energy for heating single-family dwellings with best technology, 108 MJ/m ² , year	0,00013	per litre, day

Table 2.2 Storage in restaurants, industries etc.

Product	Country	Source	Comment	Energy used, MJ	Unit and energy carrier
Food at a retailer	Sweden	Carlsson-Kanyama, 1998, p. 31	data for 1994, 100 kg food per m ²	0,027	Per kg, day, 44% electricity, rest district heating and oil
Potatoes, long term storage	Sweden	Carlsson-Kanyama, 1998, p. 32	data for 1994, 5-10 % of space utilised for products	0,025	Per kg, 4 months storage. Lighting etc. not incl. Electricity only.
Wholesaler, all storage	Sweden	Carlsson-Kanyama, 1998, p. 31	data for 1994, 5-10 % of space utilised for products	0,013	Per kg, day. Electricity 40 %, rest thermal energy