

Performance indicators for energy efficient supermarket buildings



To provide insight in the energy efficiency of a supermarket, the energy intensity (kWh/m^2), based on the total energy consumption, is the most suitable performance indicator. Both heating and cooling must be included since they are often coupled by using the supermarket refrigeration system as a heat pump. The results show that new or refurbished supermarkets generally is more energy efficient than others.

Key Findings

- 1 An average energy intensity of $400 \text{ kWh}/\text{m}^2$ per year is found for supermarkets in Denmark, Sweden and The Netherlands, with an average total area of 1360 m^2 and 73 opening hours per week. Corrections are available for differences in size and opening hours.
- 2 The results show that a supermarket is energy efficient when its total energy consumption is below $400 \text{ kWh}/\text{m}^2$ per year compared to supermarkets from Denmark, Sweden and The Netherlands. The variation is high in terms of energy use. The area (m^2) referred to is the total supermarket area.
- 3 Based on the available measured data no relation could be found between the total energy consumption (heating and electricity) and the geographic region of the supermarkets; additional computer modelling in this case also did not reveal such a relation.
- 4 Developments, especially in refrigeration systems and lighting, lead to an increase of energy efficiency in new or refurbished supermarkets ranging from 1-10 % per year. Refurbishment therefore is an effective management decision to increase energy efficiency.



Figure 1. The refrigeration system of a supermarket is often used as a heat pump, to provide hot water and space heating for the sales area.

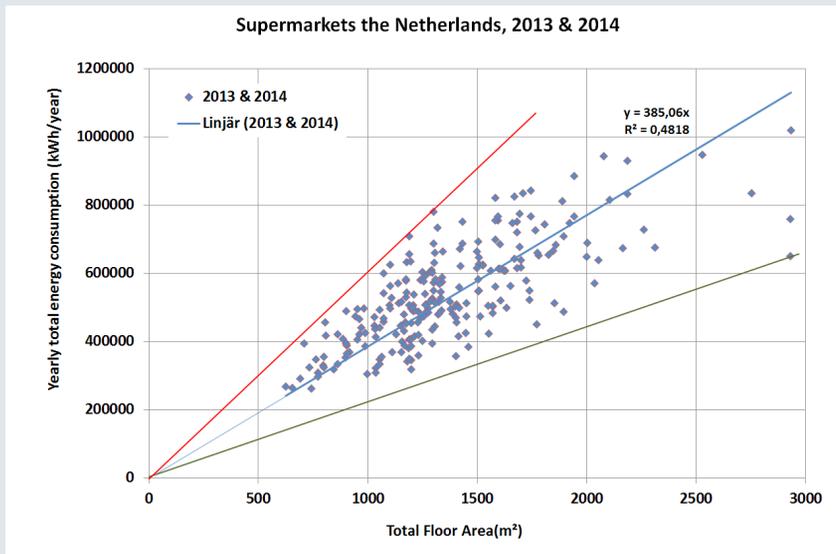


Figure 2. The distribution of the total energy consumption of a collection of supermarkets from The Netherlands shows that the yearly total energy consumption can vary considerably for supermarkets of the same size. The red line denotes the least efficient supermarket (56 % above average energy consumption), the green line denotes the most efficient supermarket (42 % below average energy consumption).

Background

There is a clear trend that more and more monitoring systems are installed in supermarkets measuring e.g. temperatures (typically to secure and validate food quality) and other relevant data. Measurements are taken and stored, and overall energy consumption data is available, but still in many cases there is no knowledge about the supermarket's energy efficiency compared to other stores in the same chain, or to competing supermarkets.

An owner of one or a chain of supermarkets needs to know the energy efficiency of their supermarket in relation to other stores, in order to be able to make investment decisions concerning energy savings.

Useful energy consumption data for supermarkets can also be used by policy makers at a national level to map energy use and benchmark best practices for supermarket buildings.

Objectives

The aims of the Annex 44 were to:

...create key performance indicators for energy efficient supermarket buildings, so that measurements and monitored data can be converted into knowledge concerning the energy performance of supermarket buildings.

...create knowledge concerning the energy efficiency of supermarket buildings from measurements and monitored data, that is useful for decision making, benchmarking and development of energy efficiency strategies for supermarket buildings.

...provide an estimate for the energy consumption of a supermarket, based on a variable number of performance indicators. With only one performance indicator used, the energy consumption will be a first estimate, but with more performance indicators used the estimated energy consumption will be more precise.

Further information

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Publications:	Final reports of Annex 44 and Executive Summary of Annex 44, available at www.heatpumpingtechnologies.org
Internet:	www.heatpumpingtechnologies.org/annex44