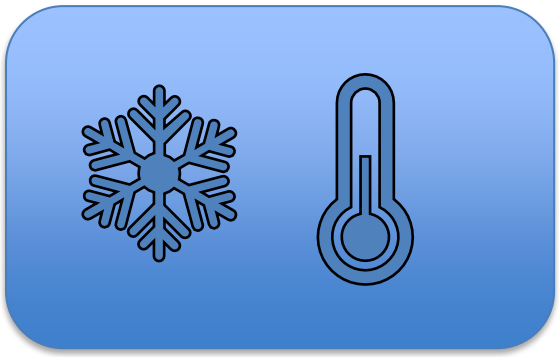
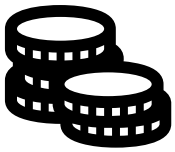
BEST PRACTICES – MANAGEMENT
FACTSHEET

ICCEE
Improving Cold Chain Energy Efficiency in food and beverage sector





'Choose freezing temperatures wisely'

Germany (Europe)

TRL 9

Investment (real or estimated)

Starting from 0 €

Savings

3-5 % of refrigeration consumption per °C

Other benefits

Reduced effort due to temperature management system

Adjustment of cooling temperatures

Taking a view on the necessary cooling temperatures of your products is a very low-cost and easy measure with a significant potential to save energy costs. Besides from simply checking if your thermostats are set adequately you can also reorganise the way product groups with different temperature needs are stored or apply an intelligent temperature management system.

To realise the low-cost efficiency potentials in cooling, an appropriate temperature selection based on the requirements of the products to be refrigerated or frozen, as well as on the properties of the equipment is easily feasible.

Smarter temperature selection

Many frozen food products must be kept below -18°C. So, to achieve this limit, manufacturers of such products will generally set their thermostats to -23°C or lower allowing a safety margin. This buffer is selected to account for doors to the freezers being opened or perhaps for high ambient temperatures. But for every extra degree of cooling, significant additional energy is consumed. Thus some frontrunners will accept a slightly warmer temperature, perhaps -21°C. This is enabled by improvements to air curtains and freezer door seals and acceleration of the opening and closing of freezer doors. Due to these and other factors refrigeration equipment has become way more efficient in recent years. So checking if your older rules of thumb on setting the temperatures still apply for the newer equipment can lead to significant energy savings.

Efficient product arrangement

Another significant potential to realise lower energy costs is the arrangement of refrigerated or frozen products. Better temperature settings by separating products which need to be stored at different temperatures or by taking into account ambient temperature can result in a 4% energy saving for chill temperatures and 2% for low temperatures by increasing the temperature setting. For instance, where a Product A requiring 5°C is stored with Product B needing -5°C, the freezer will be maintained at the 'lowest common denominator' of -5°C. Thus, Product B will be kept 10°C cooler than

necessary wasting perhaps 15% to 20% power input.
The appropriate grouping of products (or ingredients) requires different storage temperatures in the same cold store to prevent some of the goods from being stored at unnecessarily low temperatures.
A general overview on optimal storage temperatures for different product groups is given in the adjacent table.

Whenever possible, cooling at lower temperatures than required should be avoided, as each degree of decreased temperature increases the energy consumption by an order of magnitude of 3-5%.

Example:
Intelligent temperature management saves electricity, costs and effort
In order to increase efficiency, reduce power consumption and thus act more sustainable, a german company in direct sales of ice cream and frozen specialities introduced an intelligent temperature and energy management system for their sales vehicles in the summer of 2013. The company guarantees its customers uninterrupted compliance with the closed deep-freeze chain right up to the domestic freezers. Therefore, the cold protection of the approximately 3,000 sales vehicles that leave for the 2.5 million customer households in Germany every day requires a considerable amount of energy. Previously, the temperature of the sales vehicles was usually controlled manually to -36°C, but the new temperature management system, which was developed in-house, regulates the temperature of the refrigerated body at a constant level according to the residual cold and outside temperature. For this purpose, modules in all vehicles measure the core and air temperature in the cooling structure. A receiving station transmits this data to a PC in the respective branch, where it is processed further for each vehicle. Taking into account the weather forecast for the coming day, the management program then calculates how much cold each individual vehicle will need for the next day. This not only reduces power consumption, but also significantly minimizes the effort required for temperature control. Whereas previously the temperature had to be read from the vehicles every day and the data had to be transmitted, this is now done by the measuring module. In case of temperature deviations, it immediately gives an alarm. A benefit for everyone: power consumption, costs and effort are reduced - the environment is protected.

Food product	Optimal storage temperature
Deep-frozen food	
Meat	-25°C
Poultry	-24°C
Fish	-29°C
Fruits and concentrated juices	-18°C
Vegetables	-18°C
Frozen food	
Frozen butter	-20°C
Chilled food	
Fresh meat	-1.5°C
Meat products	-2°C
Manufacturing meat	-2°C
Poultry	-1.5°C
Fish	In melting ice (-0.5°C to 0°C)
Dairy products	0°C to 2°C
Fruits and vegetables	
Low temperature (apple, blueberry, lettuce, etc.)	0°C to 2°C
Moderate temperature (pumpkin, melon, etc.)	6°C to 9°C
High temperature (banana, cucumber, etc.)	12°C to 16°C

Table 1: Optimal storage temperatures of various food products

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Opportunities and barriers to implementation

Opportunities	*Barriers*
Improved product quality	New equipment for intelligent temperature management needed
Reduced effort for temperature control with intelligent temperature management	
Can be implemented already at minor costs (by reorganising the way product groups with different temperature needs are stored)	

References

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[3] https://www.resourceefficient.eu/en
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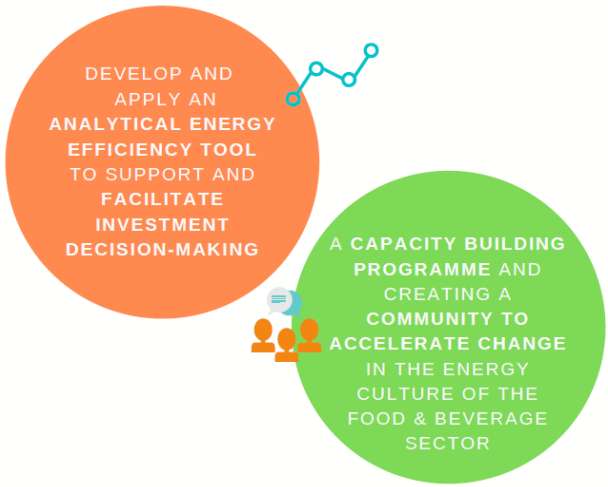
About ICCEE

The project ICCEE, www.iccee.eu, funded by the EU programme Horizon 2020, aims at improving energy efficiency in the cold chain of the food & beverage sector and making it easier for the sector to:

- undertake energy efficiency measures across the entire supply chain and
- accelerate the implementation of energy audit results.

ICCEE follows a holistic approach that moves from a single company perspective to the assessment of the entire cold supply chain. Existing financing schemes for SMEs will be assessed: the optimal ones will support the implementation of energy efficiency measures. ICCEE objectives build on 2 pillars:



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