a::Inc SAVE ENERGY WITH CORE TEMPERATURE INTELLIGENCE

SAVE ENERGY, IMPROVE FOOD QUALITY

Increasing energy costs and risks of blackouts are affecting food retailers everywhere. Energy is the second highest operation expense retailers must deal with, which is why it is important to reduce energy consumption and decrease costs. In food retail, refrigeration and cooling is responsible for the largest amount of energy use and achieving energy efficiency is the priority when upgrading any new system.

For example, typical store refrigerators and freezers are largely over cooling food products. Because they measure air temperature, any fluctuations like leaving a door open too long or a defrost cycle, will result in the coolers ramping up, and that's a lot of energy wasted.

Core Temperature Intelligence Highlights

- Increased energy costs are tightening margins for retailers
- Cooling & refrigeration is the highest energy use for grocers
- Optimized cooling closes the gap between too low- and too high- temperatures
- A reduction of 1°C results in 5% in energy savings!

TEMPERATURE BUFFERS

To maintain safety compliance, cooler air thermometers have thresholds for high- and lowtemperatures. For example, if the air temperature increases quickly, the coolers will correct for the increase in air temperature, ramping up and bringing the ambient temperature down.

However, because air temperature fluctuates quicker than product temperature, the threshold gaps for high- and low- air temperature can be narrowed. This reduces the energy requirements and minimizes overcooling with Axino Core Temperature Intelligence.



Example Deep Freezers

- Potential to reduce overcooling is up to 7°C
- Core temperature of the product on average -23°C
- Cooling based on air & Core Temperature

Example Plus Coolers

- Potential to reduce overcooling up to 6.5°C
- Maximum core temperature is 4°C or lower than necessary
- Average temperature below 0°C





Save 6% on energy per degree Celsius

Transmission losses are accounted for

- Overall, 100% of the losses are linear to about 20°C (or Kelvin).
- So if the temperature difference is reduced by 1°C, that's an energy reduction by 1/20, which is equal to 5% energy saved.
- An additional 1% energy savings can be assumed when the system is optimized for CTI thresholds. A critical refrigeration unit can be optimized and thus the system can be operated with optimized parameters (e.g. evaporating pressure).

ASSUMPTIONS BY RETAILER

Assumption saving = 6% of energy per 1 °C Assumption savings per cooler at 1 °C = 300 kWh/a cooler length = ø 2m. Assumption price kWh 0.3 Euro

| Refrigerated cabinets (incl ready to plug in) | Plus Coolers | Deep Freezers | Total |
|--|--------------|---------------|-------|
| Example: 100 stores | 4,100 | 1,200 | 5,300 |

CALCULATIONS

2.0°C Optimization potential average for plus cooler 5.0°C Optimization potential average for deep freezer

| Cooler Type | Number of coolers | Temperature buffer °C | Optimization potential °C | Savings per cooler |
|--------------|----------------------|--------------------------|------------------------------|-----------------------|
| Plus Coolers | 4,100 | 8030 | 2.01 | 302 kwH/yr |
| Deep Freeze | 1,200 | 5998 | 5.00 | 750 kwH/yr |

SAVINGS IN ENERGY COSTS

| Energy | Plus | Deep | Savings | Savings | Total |
|----------------------|------------------|----------------|--------------|-------------|----------|
| savings / yr | Coolers | Freeze | Plus Coolers | Deep Freeze | Savings |
| Savings per store | 12,407 kWh/yr | 9128 kWh/yr | €3722/yr | € 2738/yr | €6460/yr |

ABOUT AXINO

Axino combines IoT sensor technology with patented AI algorithms to ensure freshness while reducing energy consumption. By digitizing and automating quality management process, we take the guess work out of food safety (HACCP) compliance. Learn more at www.axino.ai

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