

Enhancing Efficiency and Safety with Thermoscreens Cold Store Air Curtain



A leading supermarket chain, sought an innovative solution to improve energy efficiency and safety within their cold stores.

Thermoscreens provided the patent-pending CS (Cold Store) Air Curtain, a cutting-edge air curtain designed specifically for cold storage environments. This case study explores the benefits, functionality, and impact of the CS Air Curtain installed at a leading supermarket cold store.

Problems they were facing

The supermarket encountered several critical issues within their cold store that impacted both operational efficiency and safety. The primary problem was the significant build-up of ice and hoarfrost around the doorway, creating hazardous conditions for employees transporting goods, which increased the risk of slips and falls.

Additionally, frequent door openings led to considerable temperature fluctuations, causing the chillers and condensers to work harder to maintain the desired internal temperature. This inefficiency resulted in high energy costs, straining the operational budget. These challenges not only compromised the safety and productivity of the workforce but also inflated operational expenses, highlighting the need for an effective and sustainable solution.

Thermoscreens Solution.

Thermoscreens understood the issues being faced with ice build-up, temperature fluctuations, and high energy costs in their cold store. We agreed to trial our CS Air Curtain, a tailored solution designed to address these challenges by maintaining a stable internal temperature, preventing ice formation, and reducing energy consumption, thereby enhancing both the safety and the operational efficiency.

Monitoring System Implementation.

As part of the installation Thermoscreens provided the supermarket with a comprehensive monitoring system to evaluate the air curtain's performance:

- Temperature Sensors: Three sensors inside the store and one outside track temperature changes when the door is open.
- Door Switch: Monitors the frequency and duration of door openings.
- Power Meter: Measures the compressor's workload to quantify energy savings.

The goal of the trial is to prove the commercial benefits through the installation of Thermoscreens CS Air Curtain in comparison to the industrial insulated doors currently installed.

Thermoscreens have completed monitoring of:

- The temperature throughout the room
- The ambient temperature outside the room.
- The power/energy used by the coldstore.
- The amount of door openings and the length of time in which it is open.

Temperature within the cold store.

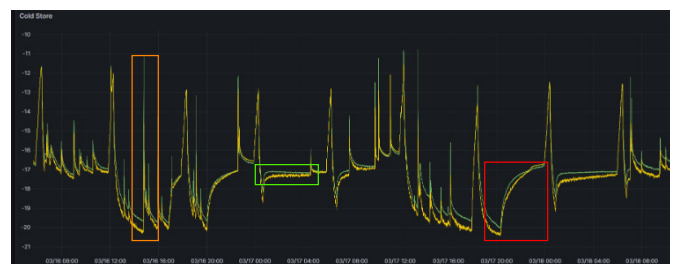
Pre Air Curtain

The graph above evidences the temperature within the cold store before the air curtain was installed. The blue line indicates that the peak temperature in the coldstore exceeded 7.5°C. The orange box shows the defrost cycle, which affects the air temperature within the room, bringing it down to -1°C. The green box illustrates a temperature difference of approximately 5°C between the front and the back of the room. Lastly, the red box marks the compressor turning off after reaching the set point, with this cycle lasting 15 minutes.

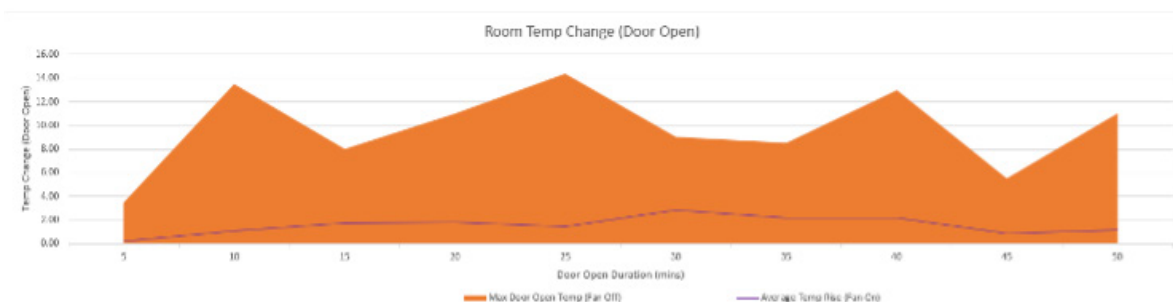


Post Air Curtain

This graph highlights the temperature within the cold store after the air curtain was installed. In contrast, the blue line now shows a peak temperature of -11°C, an improvement of 18.5°C. The orange box also shows a peak at -11°C, marking an improvement of 11°C. The green box indicates that the temperature difference from the front to the back is now within 1°C, creating a more stable environment. Additionally, the red box highlights that the compressor turns off and remains off for up to 4 hours.



As seen in the graph, the temperature is greatly increased when the Air Curtain fan was turned off and the door was open (orange). However, as seen by the line in the graph, once the Air Curtain fans were turned on there was very little difference in temperature when the door was open (less than 3 degrees).



Energy Usage.

Pre Air Curtain



Post Air Curtain



The graphs above highlight the energy usage of the cold store both pre and post air curtain installation. It is clear that after the air curtain was installed the energy usage was significantly reduced. It is important to note additional differences not shown on the graph that provide further context. Before the air curtain installation, the ambient temperature outside the room was around 7.4°C, compared to 15.3°C with the air curtain, which is a major positive for the air curtain's effectiveness. Additionally, the doors were open for nearly the same amount of time each day, with 1.98 hours without the air curtain and 1.95 hours with it.

In summary, the coldstore environment is more stable and colder with the addition of the air curtain. The operational benefits of the CS Air Curtain have been proven, as evidenced by the installation at the supermarket which has had no ice build-up for around two years.

While the monetary benefits are challenging to quantify, they are significant for considering the ROI of the CS Air Curtain. The unit's installation has kept the compressor off for substantially longer, showing a 1600% improvement, which positively impacts the compressor's lifespan. Additionally, maintaining lower temperatures and eliminating ice build-up could allow the defrost cycle, which uses the most energy, to be adjusted to a more operationally efficient on/off temperature-based cycle at the evaporator.

Furthermore, the improved air flow could mean that fewer or lower-duty evaporators are needed to maintain the correct environment, leading to significant commercial and energy benefits. Although it is difficult to assign a precise value to these benefits, we can demonstrate a reduction in kWh usage before and after the Air Curtain installation, as shown in the graphs below.

Preventing Ice Build-Up.

The CS Air Curtain significantly reduced hoarfrost and ice build-up around the doorway of the cold store. This reduction decreased health and safety risks for employees and cut down on costs associated with defrosting, equipment replacement, and downtime.



Images before installation show substantial ice buildup, whereas images after installation reveal a clear, ice-free doorway, emphasizing the air curtain's impact.

Sustainable Alternative to Traditional Methods.

Compared to PVC strip curtains and insulated doors, the CS Air Curtain offers a more sustainable and efficient solution. The supermarket were previously using more traditional methods of climate separation which often failed to maintain consistent climate separation due to frequent door openings. This meant that each time the door was opened, the expensive internal conditioned air was able to escape outside. After the successful installation of the CS Air Curtain, these temperature fluctuations were a thing of the past.

Impact on Sustainability and Cost Savings.

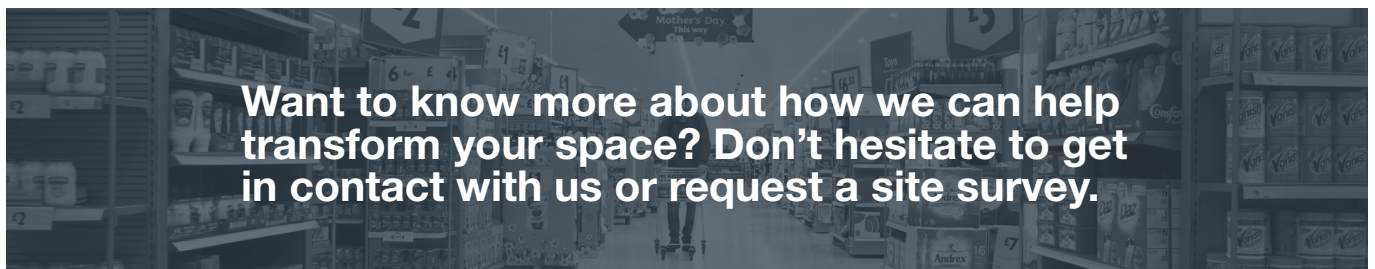
There are multiple unquantifiable benefits to installing our Air Curtain, which will also improve the ROI. These include: avoiding the need to replace Kenfield-style doors every 2-3 years, eliminating compensatory pay for slips and falls caused by ice build-up, extending the compressor's life due to increased off time, and reducing the time and money spent defrosting the coldstore and renting equipment to prevent stock loss. Additionally, the lack of ice build-up allows for fewer evaporator defrost cycles, which are a major electrical load, and enables the supermarket to consider reducing the duty or number of evaporators needed due to improved air movement and temperature stability. General repairs should also decrease, as the maintenance program for the Air Curtain involves only a biannual visible check.

Conclusion.

The installation of the Thermoscreens CS Air Curtain in the cold store has demonstrated significant improvements in energy efficiency, cost savings, and employee safety. By integrating this innovative solution, the supermarket chain is positioned as a leader in sustainability within the cold chain industry. The CS Air Curtain not only meets the immediate needs of energy conservation and safety but also offers a long-term, sustainable alternative to traditional cold store management methods.



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Want to know more about how we can help transform your space? Don't hesitate to get in contact with us or request a site survey.

Thermoscreens

Your environment is our expertise.

Thermoscreens were one of the pioneers of modern air curtain technology, and we remain at the forefront of its evolution today. Our sales team work hand-in-hand with an international network of distributors, providing solutions to customers of all types and sizes, in more than 50 countries. Across the globe, our name is synonymous with the highest quality standards; our products renowned for their energy efficiency, reliability and ease of use.