



Topic

A roadmap towards net zero in the cold chain

Author

Rob Lamb
Group Sales and Marketing Director



How could technology provide answers to the net zero challenge in cold chain facilities - The journey so far and a look into the future

Transitioning towards a net zero cold chain sector makes sense on multiple levels. Not only will reducing energy consumption and curbing harmful emissions be of benefit to the environment, but it will also incur significant financial savings for facilities owners and operators. As a result, putting in place a dedicated energy reduction strategy for achieving that objective should be a priority.

A net zero scenario might seem distant at the present time, but in the words of the great Nelson Mandela, "It always seems impossible until it is done." With that in mind, the cold chain sector must step up to the challenge and find ways to cut current emissions. Ongoing optimisation and continuous incremental gains – accompanied by a change in global attitudes and a transition to renewable sources of energy – are key ways to bring the net zero dream closer to reality.

It may be helpful to recognise the progress that has been made so far and the room for improvement that remains. Evaluating current cold store performance and devising a strategy for how it can be optimised and enhance to reduce energy use and emissions is currently high on the agenda. However, to take the all-important next step towards a net zero cold chain sector, further reviewing of what long-term changes are required is necessary.

The most noticeable step towards achieving energy reduction targets in recent years has been an increased focus from cold store operators on electricity usage. Total cost of ownership for a refrigeration system is made up of initial capital expenditure, annual maintenance/service charges and energy consumption over the plant's lifetime. Industrial refrigeration plant has a life expectancy of 20+ years, and energy typically

accounts for more than 60% of the total cost of ownership. There has been a growing recognition that focusing on energy helps businesses to achieve both their environmental and financial goals.

The story so far

Since the introduction of the Climate Change Agreement (CCA) in 2013, considerable headway has already been made in the fight to boost the environmental credentials of the cold chain industry. For example, actual energy reduction performance has consistently exceeded all targets set by the CCA, with 2018 showing a 16% year-on-year improvement compared to 2017. The CCA target for that period was just 9.6%, demonstrating how impressively the industry has performed so far.

Although the big picture might make for encouraging reading, not all its component parts are pulling in the same direction. 55% of the units surveyed in that 2017/18 period exceeded their objectives, contributing to the strong overall performance. At the same time, the same study revealed that 45% of businesses did not achieved their goals, highlighting how much more work lies ahead in reaching a net zero future (see figure below)

Plenty Of Room For Improvement



Figure 1. Government report on cold chain performance against CCA targets

Much of the progress made has been attributable to advances in industrial hardware such as the widespread adoption of variable speed drive (VSD) motors for compressors and pumps and EC fans for air coolers and condensers. Application of this technology has been shown to provide a saving of around 19% when compared to traditional technology.

In addition to hardware improvements, there have been significant improvements in refrigeration system control software. Modern control systems are able to integrate

variable speed technology and optimise other aspects of the plant's performance-based cooling demand and ambient temperature. This can deliver further savings of around 15% throughout the year and provide insight into when the plant is moving away from peak performance and needs maintenance.

Aside from hardware and software, optimising operations is another area where impressive results have been reported. For example, simply raising the temperature by a single degree in a cold store can incur energy savings of 2% to 3%, prompting some units to switch their protocols from -25°C to -20°C and reaping significant savings of up to 15%. While this does reduce the temperature buffer and diminishes the margin for error in case of accident or emergency, improved controls and plant reliability can compensate for these shortcomings.

Meanwhile, cutting out inefficiencies is another

important way in which companies have made progress. The ingress of heat from external sources is one of the chief contributors to energy loss in a facility, with research showing that with just a cubic metre of heat ingress per second adding up to a cumulative annual total of 100,000kWhrs for a chill store and

140,000kWhrs for frozen plants. As such, adopting and enforcing best practices with regard to doors and entranceways is crucial to cutting out this flab from a company's energy profile.

What can be done today?

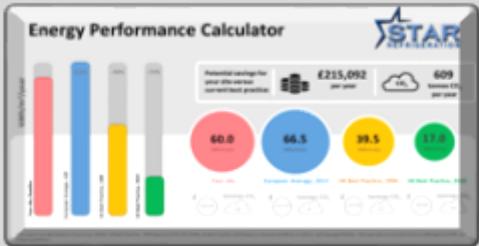
Any business serious about making strides towards a net zero future must implement a net zero strategy. This can be achieved via the following five steps:

- Benchmarking your current store's performance. By taking a note of simple statistics like your store volume and your annual consumption of energy you can begin to build up a picture of how your company is performing, both in isolation and in comparison to competitors and UK best practice. Using this insight will then enable operators to set goals for future energy reduction.

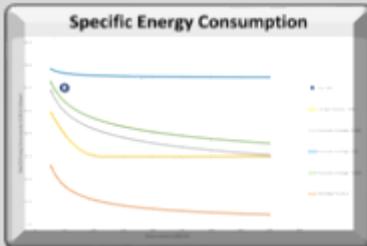
USER INPUTS *(complete yellow cells)*



Company:	Test
Site:	London
Installation Year:	2000
Application:	Cold
Store volume (m ³):	100000
Energy consumption (kWh/year):	3,050,000
Electricity cost (£/kWh):	0.13
% of stated consumption relating to refrigeration	80%



View Comparison



View SEC Chart



Send Results

Figure 3: Measuring your performance against industry

To benchmark the energy consumption of your cold store and receive a free confidential report with figures on how your cold store compares to others of similar size across the country, get in touch with the following details:

Installation Year:

Application: Cold / Chill / Mixed :

Store volume/area: (m3) / square meters:

Energy consumption (kWh/year) / Electricity cost (£/kWh):

Assessing opportunities for improvement.

Advancements in data collection and cloud based analysis also mean that real time refrigeration plant performance can be measured and compared with the original design expectations. The resulting energy gap is reported, and from this insights are generated into how performance can be improved. Data from over 50 live installations indicates that this real time data analysis can save between 10% and 30% of annual running costs, helping to move operators along the road to net zero.

tweaks and changes to your system on an ongoing basis, always striving to better your performance.

Only through acting upon a combination of all of the above factors can you expect to experience real results and make ground in your pursuit of becoming a net zero company. The technological advances are very much to be welcomed, but reducing energy demand is likely to be the single biggest factor in achieving these objectives. The good news on that front is that analysis Of Best Practices in the industry in 2019 found that energy demand could be reduced by as much as two-thirds, if all sensible precautions are taken going forwards.

What the future holds

The key to covering the last mile with regard to a net zero outlook in the cold chain sector will revolve around reducing the demand for energy and the setting of and the adherence to ambitious targets in all aspects of the industry.

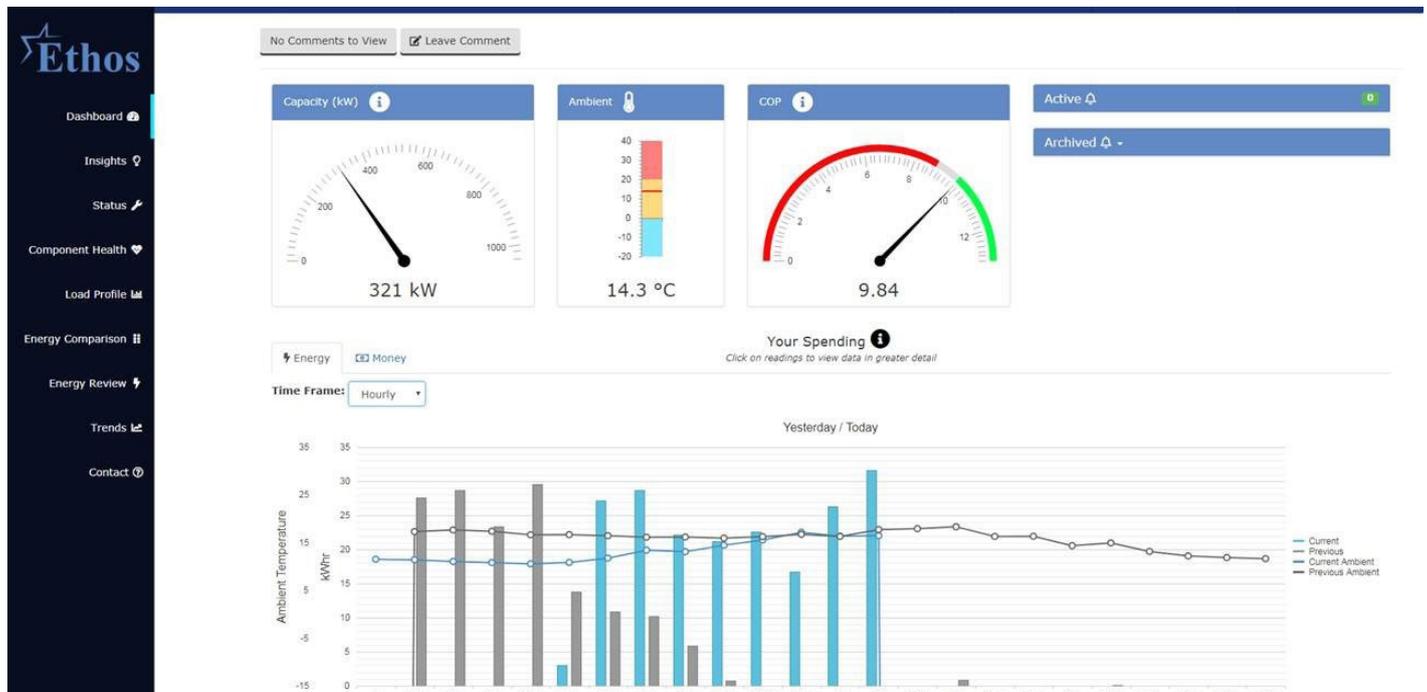


Figure 4. Ethos real time refrigeration plant performance monitoring

With all of the vital data about your store's performance laid out in black and white, it becomes far easier to pinpoint the areas where it is performing well – and those in which it needs improvement.

Implementing a strategic energy reduction programme. By mapping your current performance against your rivals and against CCA targets, you can then work on concrete measures that you can implement to enhance efficiency and reduce energy consumption. This will likely involve incorporating some of the hardware and software innovations outlined above, but will also require evaluation and optimisation of the nitty gritty of your plant's day-to-day operations.

Armed with that information, you can then implement

- **Reducing demand.** Through innovation in the way that buildings and refrigeration systems are designed, engineered and operated to reduce the transmission of energy into the building from the outside through doors, walls, ceilings and from other sources such as automation, people and product.
- **Renewable energy use.** Renewable energy will also play a vital role in bringing down emissions and ushering in a brighter future.
- **Collaboration with other industries.** The potential changes that the 21st century is likely to witness will not be restricted to individual plants. Instead, site owners must consider collaboration with other

industries to maximise efficiency and generate even more energy savings. For example, the heating sector is a far greater contributor of emissions than the cooling one, yet the latter creates vast amounts of waste heat as a by-product of its operations. Finding ways to connect those two processes to balance the heating and cooling demand will be crucial in creating a truly sustainable business environment.

- *'Waste heat' re-use.* The next step will be to find uses for the 'waste heat' which is currently rejected into the atmosphere from current refrigeration systems. This is where a more joined up approach to cooling and heating will provide real benefits, as it substantially reduces energy bills and carbon output

Envisaging a net zero landscape for your temperature controlled storage facility in particular and for the industry in general might seem like a daunting prospect at the present time. However, by taking the time to appreciate the progress that has already been made, employing the available technologies and appropriate best practices in your operations and approaching the future with positivity, perseverance and a constant need to improve your performance will turn that dream into a reality.

For further information, contact rlamb@star-ref.co.uk

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Star Refrigeration

Thornliebank Industrial Estate, Nitshill Rd, Thornliebank, Glasgow G46 8JW

Tel: 0141 638 7916 star@star-ref.co.uk

@StarRefrig

www.star-ref.co.uk



The Star Refrigeration Group

