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## Topic

**The use of SEC as a predictive metric for business performance in the TCS&D sector**

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# The use of Specific Energy Consumption (SEC) is valuable as a benchmark of temperature controlled storage energy usage against prior performance, rival companies and industry best practice, as well as a predictor of the effectiveness of any improvements made to a refrigerated warehouse.

The price of electricity in the UK today is roughly double what it was a decade ago. There is also greater volatility in the pricing market, making future expenditure more difficult to calculate. Given that paying for energy typically consumes between 9% and 17% of a cold store facility's revenue, and that the refrigeration system often comprises upwards of 70% of those costs, it makes sense to mitigate spending as much as possible by optimising energy use.

What's more, recent studies demonstrate that for most cold and chill storage warehouses in Europe, there are opportunities to reduce energy use, lower carbon emissions and make significant fiscal savings. According to the pan-European study ICE-E which collated energy data from over 800 stores between 2008 and 2012, the average Specific Energy Consumption (SEC) of a large site was 50kWh/m3/yr. Recent research (Pearson, 2019) indicates that new sites should be aiming for best practices of 10kWh/m3/yr, a fivefold reduction in energy usage. Significant savings should also be possible to existing facilities through investment in the refrigeration system, maintenance and wider infrastructure.

There are a number of factors which affect the efficiency of a temperature controlled storage facility, some of which are governable and some of which should be merely regarded as extenuating circumstances when measuring performance. For example, the utilisation and condition of the building itself are eminently within the control of the site owner or operator, as is the management of its day-to-day operations and processes. These can be tweaked and optimised to ensure that as little energy as possible is used in the operation of the plant, without compromising on its ultimate goal or allowing its performance to slip.

This could involve such measures as upgrading equipment materials and components, installing the latest technology and employing good maintenance practices as well as machine learning algorithms to optimise business processes. Other factors affecting plant performance, such as the weather, should be acknowledged and perhaps offset by compensating measures (like the installation of solar panels). Even if they cannot be altered or accommodated, they should be taking into account when assessing the plant's performance over time.

Indeed, long-term performance analysist is the key to understanding whether or not the aforementioned improvements are having their desired effect and whether the facility is being run in the most efficient and sustainable way possible. SEC is an excellent method of doing so.

Specific Energy Consumption- which is defined in terms of kilowatt hours per cubic metre per annum (kWh/m3/yr) – has been identified as a meaningful metric for tracking performance of an industrial refrigeration system in cold stores, chill stores and distribution centres.

It allows owners to compare their plant's current energy use against other sites within a company, against that of its competitors and industry best practice. Recently, SEC has been further developed to enable this metric to be employed in the assessment of the effectiveness of ongoing service and maintenance and it can now offer a projection of

how the plant is likely to fare in the future as a result of those works.

Using SEC as a benchmarking tool is straightforward. Star Refrigeration have developed a free app – the SEC Calculator – that allows operators to do their own calculations. All that is required for the analysis is basic refrigeration plant details including the annual energy consumption and volume of the facility. Any operators interested in how their cold store is performing against other sites, industry average and best practice are encourage to download and use the free app.

Day-to-day planning of business operations and capital expenditure as well as the plant's future performance, are also possible with the use of the SEC metric as a predictive energy consumption tool.

The most effective method of doing so is by compiling several datasets of varying length. This can be done by installing sub-meters to measure the specific energy use of individual components and processes and record data in order to build up a baseline of system performance to enable future comparisons to be made. For the best results, it's advisable to collect and analyse data over a short-term (10-day) period, a medium-term (90-day) period and a long-term (270-day) period. It's necessary to balance these different periods since shorter ones reveal insights more quickly and offer a further-reaching prognosis, but are not as accurate as their longer counterparts. But what these long windows provide in accuracy, they lack in rapidity and adaptability.

By cross-referencing each of these different predictive SEC timeframes against the full year figure, it is far easier for site managers to anticipate whether the running of the plant is likely to surpass its previous performance in the short, medium and long terms. As a general rule, the long-term projection should always be lower than the annual SEC value to indicate that the operation of the plant is moving in the right direction.

If the long-term projection is found to be higher at any point, it could be indicative of a malfunctioning component, an inefficient process, recent maintenance work or some other shortfall in system operation, which is compromising the optimisation of the site. An investigation can then be conducted to identify the he cause of the change so that remedial action can be taken quickly to keep the plant electricity use under control.

Modern data monitoring and performance optimisation systems such as Star' s Ethos energy optimisation software are now able to forecast the future energy consumption of a refrigeration plant by recording, analysing and trending live energy usage data. The outcome can then be scrutinised to gain further insight into the root causes of potential inefficiencies, including increased cooling demand; poor control, reduced component efficiency and excessive auxiliary power consumption. Therefore operators can easily identify where the problem lies and devote the necessary resources to addressing it promptly. This results in lower energy bills, larger profit margins for the company and an enhanced environmental profile.

The use of SEC in this particular setting has proven to be an effective method of predicting energy consumption in temperature controlled storage facilities across the UK and in evaluating the financial effectiveness of performing planned maintenance on refrigeration systems.

If you are interested in learning more about this and how to use SEC to compare your plant's energy performance against industry standard and best practice both historically and predictively, please get in touch. We can help you to understand how your cold or chill store's use of energy can be optimised for maximum financial performance.

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