Predictive maintenance & Energy Optimisation

The way to reach your sustainability goals while lowering costs.

ClimaCheck

INTRODUCTION

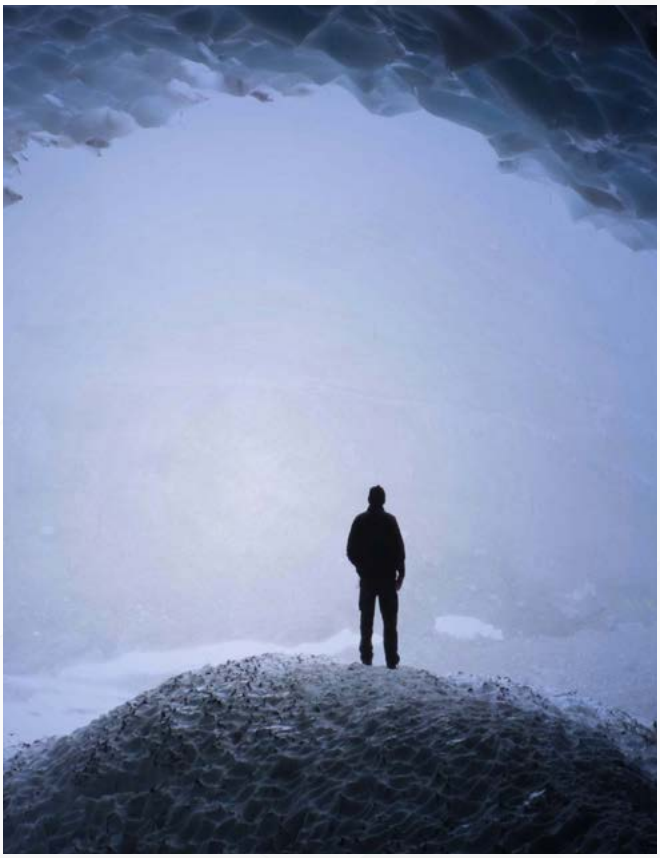
A lot of companies are facing a wide variety of challenges today, especially in the wake of the pandemic, which has forced many companies to change how they operate and where they direct their focus. Going "back to" normal is not an option. With increasing environmental expectations, many businesses need to accelerate their environmental work if they want to be competitive.

Symbolic sustainability goals that just a few years ago were popular in market communication for companies, governments and the public institutions are not enough today.

During the pandemic saving jobs and staying afloat, naturally became a priority for a lot of organisations and environmentally oriented initiatives were pushed down on the agenda. At the same time organisations who have done the basics in adapting to new requirements, find that moving further becomes more complex and technical than just separating waste, choosing green electricity and putting up some solar collectors on a roof.

In the middle of that the society is starting to open up, the IPCC report was released and gave an abrupt wakeup call to many organisations to accelerate the work further. Buildings consume approx. 40% of the world's energy and contribute up to 30% of its annual GHG (GreenHouse Gas) emissions, making the people who manage real estate one of the most important decision making groups on earth to prevent global warming.

This is not relevant or easy to establish for energy optimisation and predictive maintenance. Frequently existing and past costs have not been separated and therefore the baseline to calculate savings isn't available in the organisation. Optimisation of cooling and heat pump -systems can massively impact energy consumption, maintenance cost and downtime of equipment, which in turn heavily reduces CO2 emissions as well as reducing costs in the organisation.



THE POWER OF PREDICTIVE MAINTENANCE

Time is one of the most precious things we have, and a limited resource for most organisations. Unpredicted events can set back projects for days or weeks if you are unlucky. Being prepared is necessary, however change can be hard. Today, no one would argue to keep connecting to the internet via a 56k-modem when the benefits of moving to modern communication are clear.

Predictive maintenance is the same, when the benefits are clear it is a no brainer. When it comes to energy optimisation and predictive maintenance of cooling and heat pump-systems it is possible to move from a 56k-modem directly to fiber.

By implementing predictive maintenance, any deviation in your cooling or heat pump -system will be noticed and can be fixed when they appear and the responsible person will automatically be informed about it. Ensuring that the system always runs at an optimal rate and is prepared to withstand the test of time and simultaneously save time.

Time isn't everything that can be saved, let's not forget about the huge amounts of wasted resources that can be saved by avoiding breakdowns. Imagine a hospital or a large food wholesaler without cooling or refrigeration capabilities. The result of a system failure in these settings could be a huge loss of perishable goods, production , money or in a worst case scenario, lives. Predictive maintenance is a method that is starting to reach the conservative business of HVACR. Historically most of the maintenance has been reactive as preventive (time based) often is not capable of avoiding alarms and failures. The transformation to predictive maintenance has been made possible by the development of cost effective sensors and moderna data communication that is the foundation of Internet of things "IoT". Collecting data from thousands of systems in the cloud makes it possible to develop and introduce advanced expert systems for predictive maintenance such as ClimaCheck online.

WHAT INDUSTRIES STAND TO GAIN THE MOST FROM HVACR-SYSTEM OPTIMISATION AND PREDICTIVE MAINTENANCE?

When looking to lower the energy consumption, decrease CO2 emissions and save money, optimising HVACR-systems is a great place to start, because these systems often consume 30-60% of commercial building's electricity. The savings we see are usually 10-30% of the electricity by ensuring that the system runs at optimum. As an additional benefit the risk of failure and performance drift is reduced when performance is continuously monitored after the optimisation.

In reality, any industry that uses cooling and heat pump systems can make an impact. But the following four industries can see huge savings they never realised where up for grabs, as well as avoid failures and downtime by working methodically with energy optimisation and predictive maintenance:

Grocery stores, food supply and fast food chains

It is no secret that most food needs to be kept cool to last longer. In many cases, this requires refrigeration from production to consumption. Keeping the cold chain intact and thereby preserving food saves huge amounts of money and resources as businesses might be forced to temporarily close down and call in extra workers to deal with the situation if the refrigeration -system breaks down. Food wasted due to poor refrigeration can be avoided by keeping the systems in good shape with predictive maintenance and system optimisation.

For fast food restaurants and grocery stores keeping a comfortable temperature through air conditioning and controlled indoor air quality "IAQ" will improve customer satisfaction which, as we all know, is imperative to conduct successful business long term. A restaurant with malfunctioning air conditioning will likely see it's customers leaving before the entrée has been served.

Let's also not forget that early detection of refrigeration leaks means not only reduced failure rate and wear but also less GHG emissions which will help businesses stay on top of their climate goals. By using ClimaCheck online, fast food restaurants, super markets and food wholesalers can receive the proper documentation of performance needed to implement predictive maintenance and system optimisation. Thereby improving by:

- Lowering service costs
- Reducing food waste
- Avoiding system failures
- Avoid bad will, damage to brandreputation and customer frustration
- Lowering CO2 emissions
- Optimising energy consumption

Example:

A food store chain is dependent on the cold chain to get their products from production to their consumer's grocery bags. Large quantities of the food that passes through the chain require refrigeration during the entire or parts of the journey.

During any step of the chain, there is a risk that the food will be spoiled if not properly refrigerated.

When the "low temp" refrigeration rack at one of the stores break down due to corrosion of aluminum fins in condenser, showing up at high ambient, that predictive maintenance would have detected many month earlier , cause the following to occur:

- **Large quantities** of food waste as there was no time to move goods
- Loss of sales that often is as costly
- Frustrated customer that has to go to competitors until a temporary repair with a second hand condenser has been installed which in this case took five days.
- **High service costs** - Getting the system up requires specialised service personnel to come in and replace the condenser. As no suitable condenser was available locally a temporary repair was done with a second hand condenser that the contractor had access to. This at a significant cost but seen as necessary instead of being unable to sell frozen food for three weeks before a suitable condenser was available.
- **Extra staff costs** - Dealing with the problem doesn't just require service technicians. Extra staff was required to firstly deal with the food waste and secondly to restock their units when the problem has been fixed. This also comes at a great cost.

Hospitals & pharmaceutical industry

Imagine rolling a patient down the hall to the surgery room, knowing that you are about to help save the patient's life through a kidney transplant, when you get the information that the cooling-system has broken down and humidity and temperatures cannot be maintained within limits. It poses immediate danger as increased humidity jeopardises sterilisation and all planned surgeries that day will need to be postponed due to lack of dehumidification, costing the hospital buckets of money. Or try to put yourself in the shoes of a vaccine researcher, when without warning your samples are rendered useless when a malfunction causes the refrigerators to go off.

These incidents (and many more like them) take place every year in-spite that they can be avoided, because predictive maintenance is overlooked in HVACR-systems. Issues that could occur if parts or the entirety of the cooling -systems break down in a hospital or research center are:

- Canceled surgeries
- Lack of access to equipment such as MRI and other equipment depending on cooling for their operation.
- Destroyed/delayed research
- Food waste in restaurants
- Costly repairs, downtime and damage to reputation
- Destroyed medicine

Example:

At a large university hospital that among other things performs routine surgeries. On one particularly hot day, the cooling-system collapses because the capacity is insufficient due to low refrigerant charge that cause the system to trip on low pressure when maximum capacity is required and expansion valve cannot cope with low charge.

On this day there were over 60 surgeries scheduled, all of which had to be canceled and rescheduled for a later time. Preparing a surgery costs vast amounts of money and the hospital lost tens of thousands of Euros in addition to the fact that sending patients home after rescheduling is not good for the patient or the reputation of the hospital.

This could have been avoided by making sure that the cooling system was monitored 24/7 with a system detecting decreased refrigerant charge and performance. A system that detects performance losses on component level will give early warning for any loss of efficiency as well as if there is a refrigerant leak. Early detection with detailed information pinpointing exactly where problems occur will allow them to be resolved often months prior to them causing failures and down time. It allows maintenance to be based on condition and scheduled with the right competence and service parts onsite at much lower cost and results of repair verified in a controlled manner.

Besides cancelled surgeries, other costly ramifications could happen as a result of an unexpected cooling -system breakdown:

- Refrigerators stop working - Causing large amounts of life-sustaining medicine and blood bags to be destroyed. This does not only cost a lot of money to replace, it could potentially lead to fatality.
- Costly repairs - calling for a specialised service technician to troubleshoot and fix the system is expensive, especially when compared to the low cost of predictive maintenance and doing planned maintenance based on a documented problem long before it affects the operation of the cooling.

Municipalities & Local government

There are monetary gains to be made by municipalities and local governments by optimising energy expenditures. These institutions often manage many facilities that besides office buildings and schools include skating rinks and public baths that depend on cooling. All of which require large amounts of energy to run cooling and heat pump-systems and have high costs for reactive maintenance.

But looking beyond the immediate cost cuts that energy optimization brings, these institutions most definitely have environmental goals they want and must achieve (Agenda 2030). Optimizing the HVACR-system can significantly decrease direct and indirect CO2-emission, making it an action to put high on the sustainability agenda.

For the municipalities and local government, **we have a great customers case** for you to take a look at on our website:

Read case

Real estate owners & Operators

If we want to take a look at what the benefits and risks are for real estate owners and operators concerning preventive maintenance and energy optimisation of HVACR-systems, there is a vast array to choose from. Some of the negative repercussions of an cooling and heat pump -system breakdown for real estate owners and operators could be:

- Unhappy customers - This can lead to rent reductions or reimbursements, canceled contracts, and a damaged reputation
- Expensive service costs for reactive maintenance
- Large amounts of time and money going to waste when dealing with the breakdown and its aftermath
- Possible legal actions
- Failure to reach environmental goals

Looking at it from a different perspective, there are some clear benefits of being proactive and by doing predictive maintenance and energy optimisation:

- Lower costs
- Happy customers and less stress on the individuals responsible for maintenance and customer communication
- Lowered CO2-emissions
- Lower service costs

Example

The phones are ringing off the hook at a large property owners headquarters. It's the middle of winter and one of the larger office complexes is reporting freezing indoor temperatures. A service technician that has been called to the site by the local facility manager confirms that the heat pump has stopped working due to a short circuit in the compressor and has given no prognosis of when it will be up running and full heating capacity restored. The direct electrical supplementary heating is not capable of supplying full comfort at low ambient. Frustrated and angry tenants are requesting answers that the help desk cannot respond to, and talk of rent reimbursement and poor working conditions are flooding social media channels.

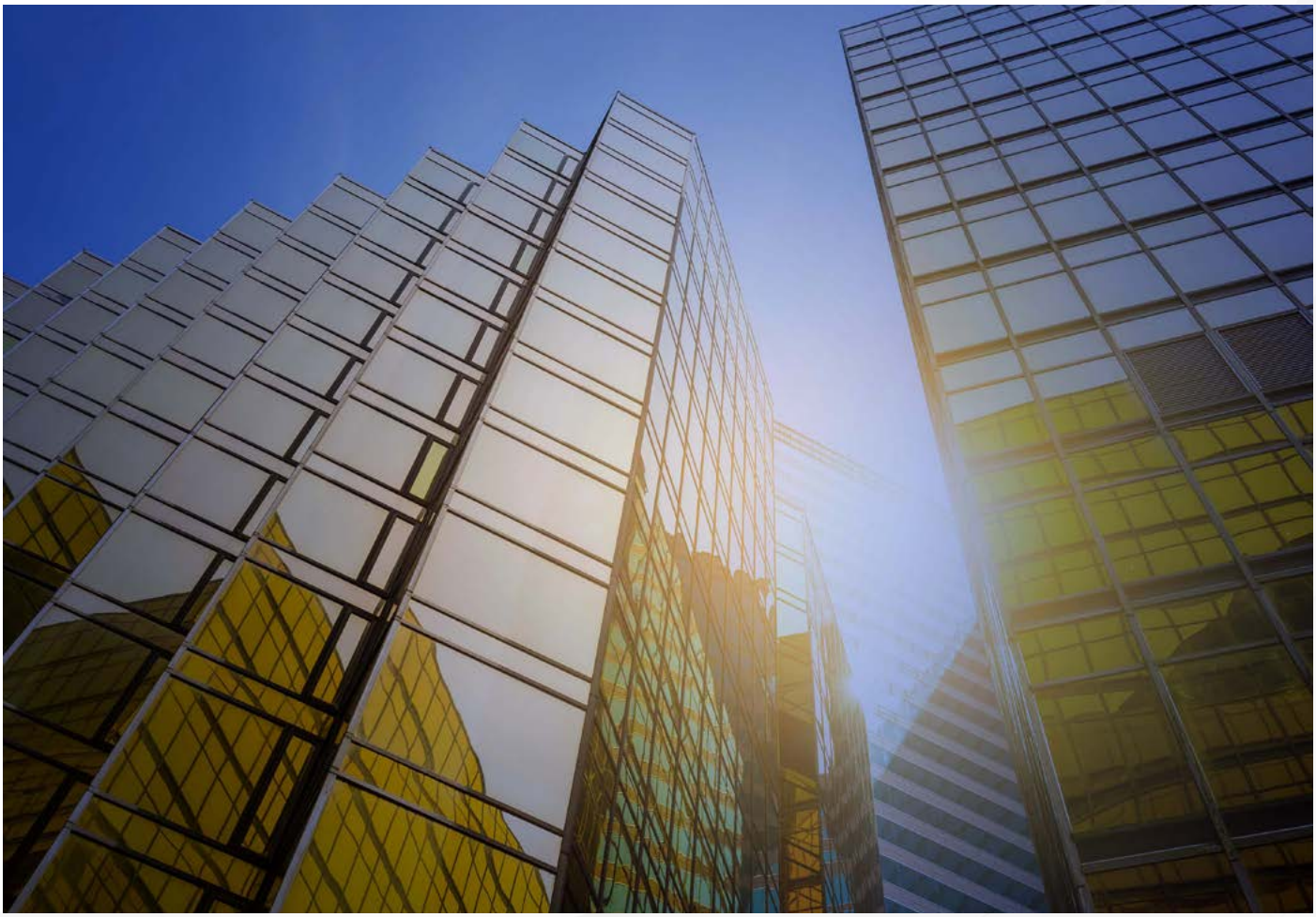
Though this is not a life or death situation, it is an extremely sensitive and expensive incident. Let's look at some of the possible effects this kind of situation have:

- Insufficient or lack of air conditioning or heating leads to an increase of temperature that cause
- Discomfort for staff and customers in the building
- Risk that Servers and other sensitive equipment stop
- Insufficient dehumidification results in risk of dripping water from cooling pipes and cold ceilings as well as increased risk of mould (am. mold).
- Expensive and unaccounted for service costs

- Unhappy tenants and guests requiring reimbursements, rent reductions or possibly even takes legal action
- Staff responsible for FM were forced to drop planned activities and focus on getting cooling/heating back into operation and dealing with frustrated customers.
- If repeated it can result in lost contract renewals or reduced revenues to avoid badwill
- Bad reputation through word of mouth, social media, and in some cases even media news outlets
- Increased GHG emissions

If documentation of performance and predictive maintenance had been a part of the strategies, failures and downtime could have been avoided . The performance information used for predictive maintenance is also essential to work with energy optimisation which helps Real Estate companies to achieve:

- Higher property value
- Lowered CO2-emissions
- Lowered service costs
- Happy tenants



HOW CAN CLIMACHECK HELP?

Staying on top of predictive maintenance will help businesses that rely on HVACR-systems to avoid breakdowns and save huge amounts of money and time with simple actions. ClimaCheck online provides the documentation needed for property owners, industry food stores & supply chains and data centers to understand when, how, and where adjustments and repairs have to be made to avoid breakdowns

Additionally, the documentation will help in optimising cooling and heat pump-systems to make sure you're using the system optimally and in the most energy-efficient way possible. This means not only that there is money to be saved in the way the system expends energy costs, but it will also help with keeping down CO2-emissions to reach climate and sustainability goals.