

CLIMACHECK – AREAS OF USE

The ClimaCheck Performance Analyser is used to document all types of vapour compression systems such as refrigeration, air conditioning and heat pump systems:

- **Product and System Development** – leading manufacturers use ClimaCheck solutions for development and product quality control. ClimaCheck supplies test rig analysing systems to manufacturers.
- **Commissioning/Recommissioning/Warranty Inspections** – after installation of new equipment or at the end of the warranty period, ClimaCheck confirms if the plant is running at the rated capacity and energy efficiency.
- **Performance Inspections** – EU Directives require performance inspections of all air conditioning units over 12 kW. ClimaCheck provides accurate and unbiased performance validation more cost effective than any other system.
- **Energy Optimisation** – ClimaCheck provides high quality decision support prior to energy efficiency measures in cooling systems and heat pumps. Internet access allows experts to study and diagnose operation effectively from anywhere in the world.
- **Troubleshooting** – ClimaCheck makes troubleshooting and fault correction a much simpler process, minimising engineers' time and energy costs, whilst extending plant life.
- **Preventive Service & Maintenance** – ClimaCheck is used for temporary or continuous monitoring of cooling and heating systems. Predefined performance reports and alarm levels ensure the equipment is working efficiently. In the EU, the number of annual leak detection visits are reduced by 50 percent when ClimaCheck is used as an indirect leak detection system.



WORLDWIDE CLIMACHECK PARTNER PROGRAM

ClimaCheck works actively with Distributors and Certified Partners all around the World to make the technology available as local competence is essential. If you want the ClimaCheck methodology included in your commissioning and maintenance, it is our Service Partners you should turn to. If you need on line monitoring with regular reports of performance and energy efficiency, you should talk to our Integration Partners. We also have Evaluation Partners offering ClimaCheck based inspection, commissioning and/or energy audits. Visit our website to find your local Partner or learn more about how to become a part of our game changing team.

Visit www.climacheck.com to find your local ClimaCheck Partner or to contact us via e-mail info@climacheck.com or phone +46 (0)8 502 552 50 to enrol in our program.

HOW AND WHY CLIMACHECK DIFFERENTIATES

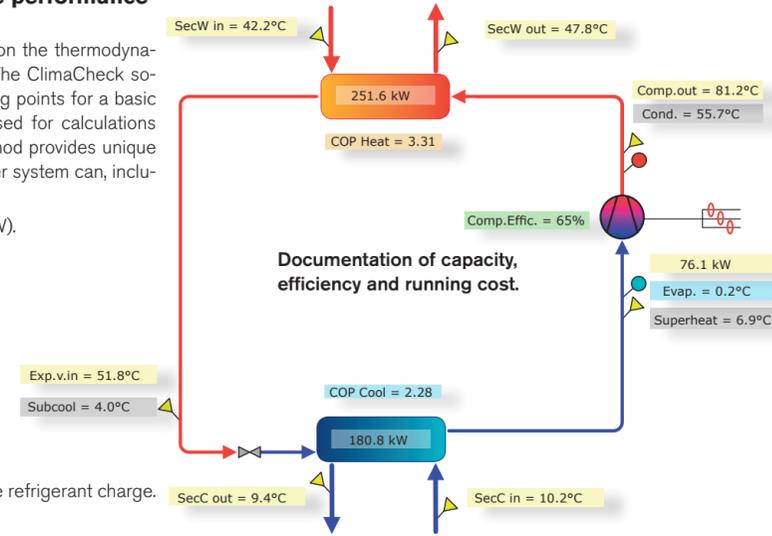
How and why is ClimaCheck different compared to traditional ways of measuring air conditioning and refrigeration systems?

ClimaCheck collect key inputs from the refrigeration circuit and performs a unique analysis of the refrigeration process, which results in more accurate and reliable information not available from any other system. This information visualises the performance of the whole process, as well as the components, which provides key information for the expert to troubleshoot and optimise. Other monitoring systems present inputs and handle alarms but do not show the information required for cost effective troubleshooting and optimisation. With ClimaCheck you are taking the step to a modern system, not only measuring performance in real time, but also allowing online validation and optimisation of your cooling and heat pump systems. Performance can be benchmarked in an unbiased way against design and manufacturer's data.

More accurate and reliable performance measurement

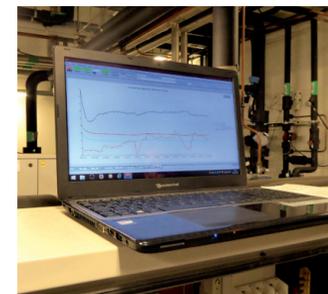
The method is scientifically based on the thermodynamic evaluation of measured data. The ClimaCheck solution is connected to ten measuring points for a basic circuit – data are collected and used for calculations and analysis. The ClimaCheck method provides unique information and results that no other system can, including:

- Cooling and Heating Capacity (kW).
- Coefficient of Performance COP/ EER.
- Compressor Isentropic Efficiency.
- Condenser Efficiency.
- Evaporator Efficiency.
- Electrical Power Input.
- Air/Water Flow Rates.
- Superheat/Sub-cooling values.
- Indication of excess or inadequate refrigerant charge.



Benchmark, validate and optimise

You have a scientific tool with which to document the performance of cooling processes that is independent of input from the manufacturer, supplier or service provider of the equipment and is therefore completely unbiased. Thus, the performance can not only be measured, but also validated and benchmarked against design and manufacturer's data. The ClimaCheck solution provides objective documentation for the total performance of the equipment and also shows the detailed functionality of each component. This provides you with a sound basis for adjusting and optimising the equipment for reduced energy consumption and increased operational reliability. System efficiency can be monitored 24/7 and energy reports distributed via e-mail at desired intervals.



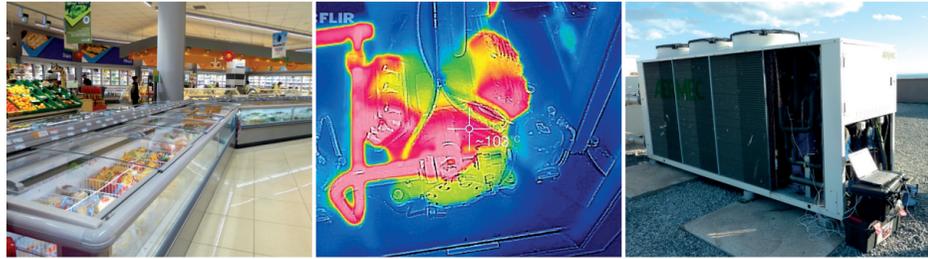
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CLIMACHECK PERFORMANCE ANALYSER

Improve energy efficiency and reliability in air conditioning and refrigeration systems





CHALLENGE

Too much electricity is wasted by refrigeration and air conditioning systems.

Did you know that 15–20 percent of the global electricity consumption is used for refrigeration and air conditioning? In hot climate zones it can be as much as 50 percent. Often one third of the electricity is wasted due to inefficient operation. Refrigeration processes are used throughout society for cooling foods and processes, air conditioning, heat pumps and dehumidifiers. For the supermarket owner or the building operator, the electricity cost for cooling is often a hidden cost within the entire energy bill, but often represents 40–60 percent. The majority of cooling systems are not working as efficiently as they should, with higher energy costs, increased risk for down time or failure, and in the end, increased carbon dioxide emissions as a result. Generally, there is a huge misconception that if a system is cooling effectively it must be efficient!

To reduce energy consumption, a clear picture of how the system is working is a must. Good analytical tools and methods are the basis for optimising the efficiency and minimising downti-

me. It has previously been difficult to cost effectively measure the performance of refrigeration systems in operation. Not anymore!

PIONEERS IN ENERGY OPTIMISATION

ClimaCheck was founded on a strong belief that the energy consumption in the world has to be significantly reduced to minimise the environmental impact it has on the world. ClimaCheck is an award winning company helping customers to increase efficiency, reliability and lifetime of refrigeration, air conditioning and heat pump systems.

Global brands such as Carrier, Johnson Controls, Emerson, IKEA, Sobeys, Bureau Veritas, Schneider Electric and Tesco have decreased their energy consumption with ClimaCheck. Many leading service and maintenance contractors, and consultants have enrolled in the ClimaCheck Partner Program and together we are changing the way the performance of cooling and heat pump systems is measured, analysed and optimised.



THE MODERN WAY TO OPTIMISE ENERGY

The ClimaCheck Performance Analyser allows you as a property owner, contractor, consultant or manufacturer to scientifically analyse and evaluate practically every type of cooling or heat pump system. ClimaCheck documents baseline performance and provides precise information on all potential areas for improvement and savings.

CLIMACHECK ONSITE

For quick system measurements and adjustments during Service or Performance Inspections, use our ClimaCheck Portable Field Case version. Connect sensors in less than 30 minutes and you will have a complete analysis on how well heat pumps, refrigeration or air conditioning systems are running.

CLIMACHECK ONLINE

A ClimaCheck Fixed Installation provides continuous monitoring of energy consumption, compressor and system performance. The system automatically sends an alert (email or SMS) if performance deteriorates, and you can at any time log in online to the cloud based portal from any computer or mobile device. You will have access to real time information via a System Efficiency Index (SEI) Dashboard, including Energy Signatures and Reports. Compressor and heat exchanger performance, as well as potential refrigerant leaks and the equipment energy profile, are monitored 24/7.



1960–1970

1990–2000

2010–

Measuring and validation is the future also for HVAC&R

The air conditioning and refrigeration sector is now undertaking a paradigm shift similar to that undertaken by the health care industry during the 60's and the automotive industry in the 90's. Doctors and car mechanics started to use new methods based on state of the art measurements and analysing in order to diagnose and prescribe the right treatment. ClimaCheck provides a game changing methodology to measure and validate performance, which in turn leads to increased possibilities to optimise and achieve lower energy consumption and early detection of problems to reduce failure rates.



ADVANTAGES

With ClimaCheck you will reduce energy costs and environmental impact, which saves money and increases customer satisfaction.

REDUCED REPAIR AND SERVICE COSTS AND LONGER LIFETIME EXPECTANCY

Breakdowns in refrigeration and air conditioning systems require significant resources. ClimaCheck's continuous monitoring allows most problems to be addressed long before failures occur. In this way you can minimise service visits and maintenance costs. You can plan for component replacement as degradation sets in, to maintain system energy efficiency and reduce costs, whilst increasing plant life time and potentially preventing a catastrophic failure. Reduced failure rates also minimise product waste, production downtime and loss of goodwill. For those working with refrigerated food, air

conditioning and process or data cooling, improved reliability improves your business and customer relationships.

REDUCING ENERGY CONSUMPTION AND ENVIRONMENTAL IMPACT

ClimaCheck documents baseline performance and provides information on potential system weaknesses. You can directly compare the cost of energy optimisation against calculated savings once the performance base line is documented. On project completion you have a record of improvements, ensuring your investment is paying back.

Studies and practical experience shows that ClimaCheck can reduce energy consumption by as much as one third. Where a fifth of world energy consumption is used for cooling, these energy reductions directly reduce global carbon dioxide emissions.



AWARDS AND RESEARCH

ClimaCheck is constantly developing the technology and is at the forefront, working with leading Universities and Test Institutes globally. For example, in the United States, the National Renewable Energy Laboratory (NREL) uses ClimaCheck in field tests of rooftop air conditioning and supermarkets. In Europe, ClimaCheck has been evaluated by the Royal Institute of Technology in Stockholm, Sweden where a research project analysing 164 cooling systems with ClimaCheck showed that 87 percent of the systems evaluated were not performing to specification. Simple system adjustments based on the information provided by ClimaCheck created up to 30 percent reduction in electricity consumption. ClimaCheck is also a member of Cleantech Inn Sweden.

ClimaCheck was awarded "Refrigeration Product of the Year" by ACR News Journal in 2009. ClimaCheck was also appointed "Climate Solver" by the World Wildlife Fund in 2011. During 2012–2015, ClimaCheck was a Partner in the "COOL-SAVE" EU Research Project aimed at saving energy in the food and drink industry.