2023 Chiller Performance Verification

Making Buildings Work

Birdsall

Obtaining Chiller Performance Data

Our Performance Verification service independently validates the operation of any chiller, reducing the risk of failure and excess energy use.

We undertake it using a portable ClimaCheck performance analyser, temporarily applied to the chiller to gather and analyse the complete thermodynamic cycle and the data from it. We typically undertake data analysis from anywhere between 4 hours and 120 hours.

The first step is for design and selection data of the chiller to be provided to accurately to determine how effectively and efficiently the chiller is currently performing against design and selection.

The analyser is connected to the chiller via a series of temperature, pressure, voltage and current sensor probes.

The cooling system is put into operation. The analyser simultaneously downloads all the performance data onto system specific software. This is accessed via the internet on a laptop by the Birdsall engineer on-site.
It is monitored and recorded via the internet by ClimaCheck on-line.

The performance analysis technology provides data of the entire system from which accurate conclusions can be made.

A reasonable analogy would be that this is similar in the medical profession to an MRI scan. Both of which provide detailed internal data from which an accurate diagnosis may be made.

Birdsall provide two service options:

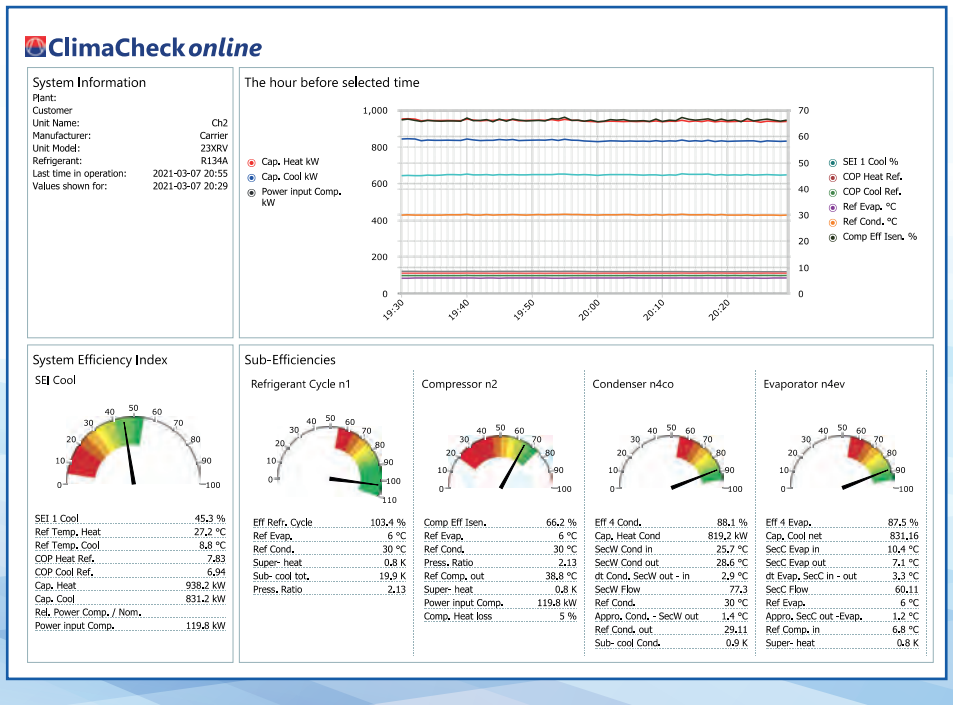
1. A full performance analysis from data collected for a period of up to 5 days and nights.
2. A snap-shot analysis from data collected for a period of 4 hours.

ClimaCheck Performance Analyser

The ClimaCheck portable performance analyser is able to monitor practically all types of chiller, no matter how many circuits they include.

It incorporates a modem and a router enabling direct access to on-line ClimaCheck which permits remote monitoring. This enables a full history to be recorded to allow energy optimisation plus access to other uses. Its lockable weatherproof case permits the required up to 5 day's analysis.

When the engineer is on the site checking the chiller using a laptop or mobile phone they do not need to connect to the chiller. They just require access to the internet and log on-line to the system.



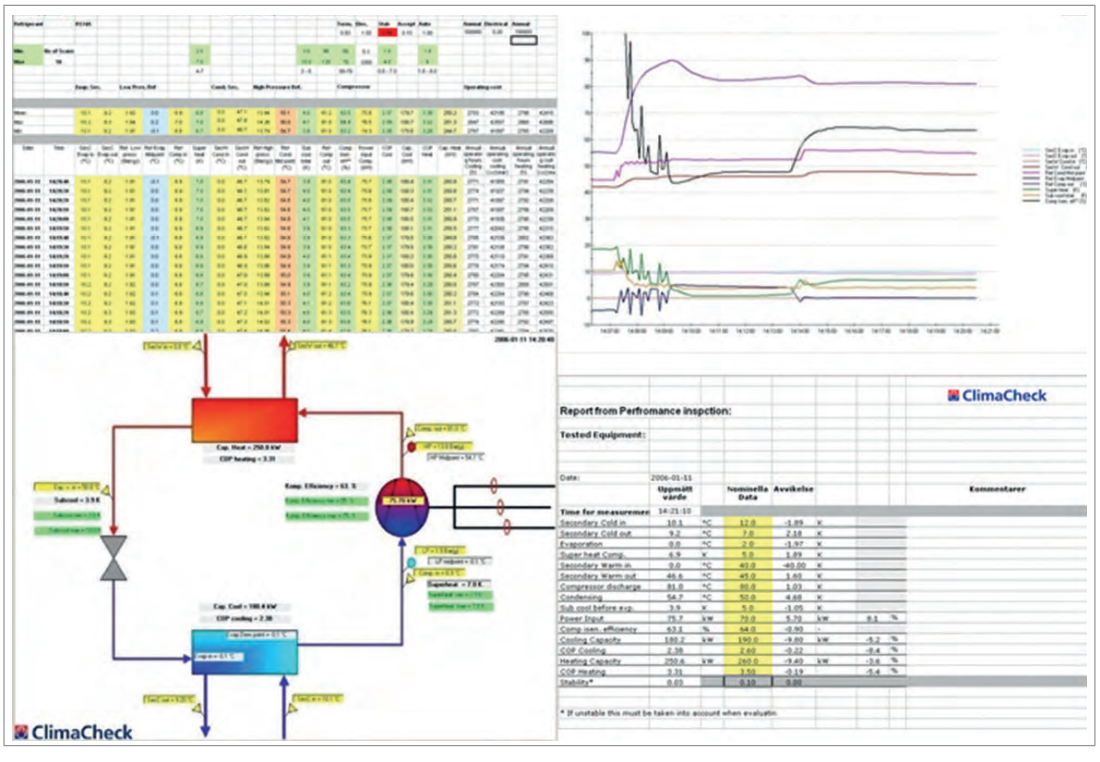
Data Download

The data downloaded includes:

- Power factor performance
- Refrigerant charge level
- Expansion valve and controls, operation and superheat are at appropriate levels
- Sub cooling levels
- Condenser fans performance, speed and number of fans running relative to maintaining accurate condensing temperatures to maximise compressor efficiency and lowest running costs
- Condenser coils performance, measuring the actual heat of rejection. Identifying any fouling and to what degree effecting efficiency
- Evaporator performance measuring the actual cooling duty
- Compressor performance liquid return, low efficiencies, any relative excessive discharge temperatures / pressure
- Drive motor performance, efficiency level
- Chilled water flow rates, and / or evaporator air flow rates, notoriously difficult to ascertain but vital for high efficiency. These can be accurately measured and set.
- Head pressure and low ambient controls set accurately
- System Efficiency Index (SEI). Relatively new and unique method, permits assessments to be accurate in low load and low ambient conditions

Chiller Performance Verification

From the data downloaded with the aid of the ClimaCheck thermodynamic analysis, the Birdsall engineer will be able to analyse and accurately validate the actual performance of the chiller, identifying all inefficiencies and incorrect settings.



Optimisation

To re-commission and optimise a chiller, the steps are to rectify any incorrect settings, faults and inefficiencies identified in the data performance analysis.

The analyses will verify external services, faults, potential faults and any deviating operating parameters, all of which affect the operating performance and operating costs.

From experience, the most common problems found that allow the system to run inefficiently are those which have been or are the most difficult to establish, measure or see without performance analysis. These include:

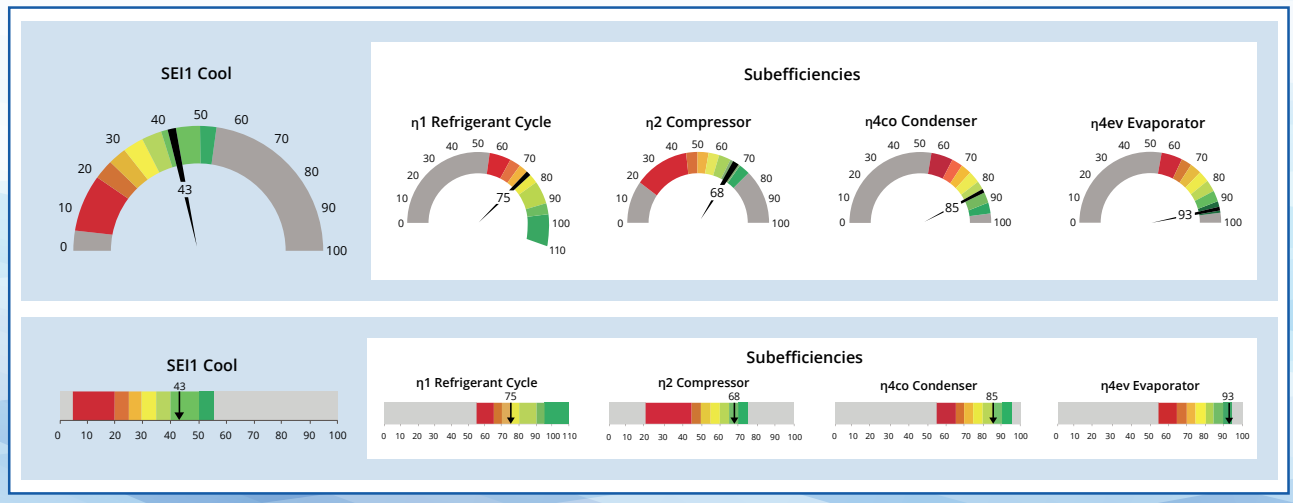
- Chilled water and evaporator air flow rates. They are not easy to accurately measure via typical external devices. By being out by only a small amount can cause havoc to the operation of the whole system.
- Incorrect chilled water flow rates can lead to a chiller running for many hours longer than necessary, greatly effecting the operating costs. Additionally never reaching the required supply temperature required for effective air conditioning.
- Incorrect condenser water / air flow rates can lead to a chiller running for many hours longer than necessary, greatly effecting the operating costs.
- Efficient sequencing of multi compressor equipment, a bit hit and miss in the past, does not need to be anymore.
- Expansion valve selection, operating range, matched to the system load, is also vital and often not undertaken accurately due to lack of visible available data.
- Accurate sequencing of multi style condenser fans, can now lead to improved efficient operation. Maintaining condensing temperatures at the lowest level permitted by compressor manufacturers envelope.
- Levels of both sub-cooling and superheat can be easily seen, adjusted to more appropriate levels and results.
- Having the precise and correct refrigerant charge in the system also seriously effects its performance. With the analysis system this can be obtained accurately.
- Additional unnecessary energy use is often seen when fixed chilled water set point is used instead of floating control. This can be clearly identified with ClimaCheck.

Once complete the cooling system is effectively recommissioned, operating to a fully optimised performance. This unbiased total thermodynamic analysis validates the chillers performance.

From the experience of others an increase in efficiency of between 5 to 10% can be expected. In some cases 40% has been achieved.

With the chiller performance analysis complete, a detailed report with useful images and explanatory graphics are produced. The engineer would brief the customer on its contents.

This would include an operating cost estimate for before and after any rectification adjustments or corrective works. This could also be used to explain and justify any recommended works and evaluate & measure them upon completion.

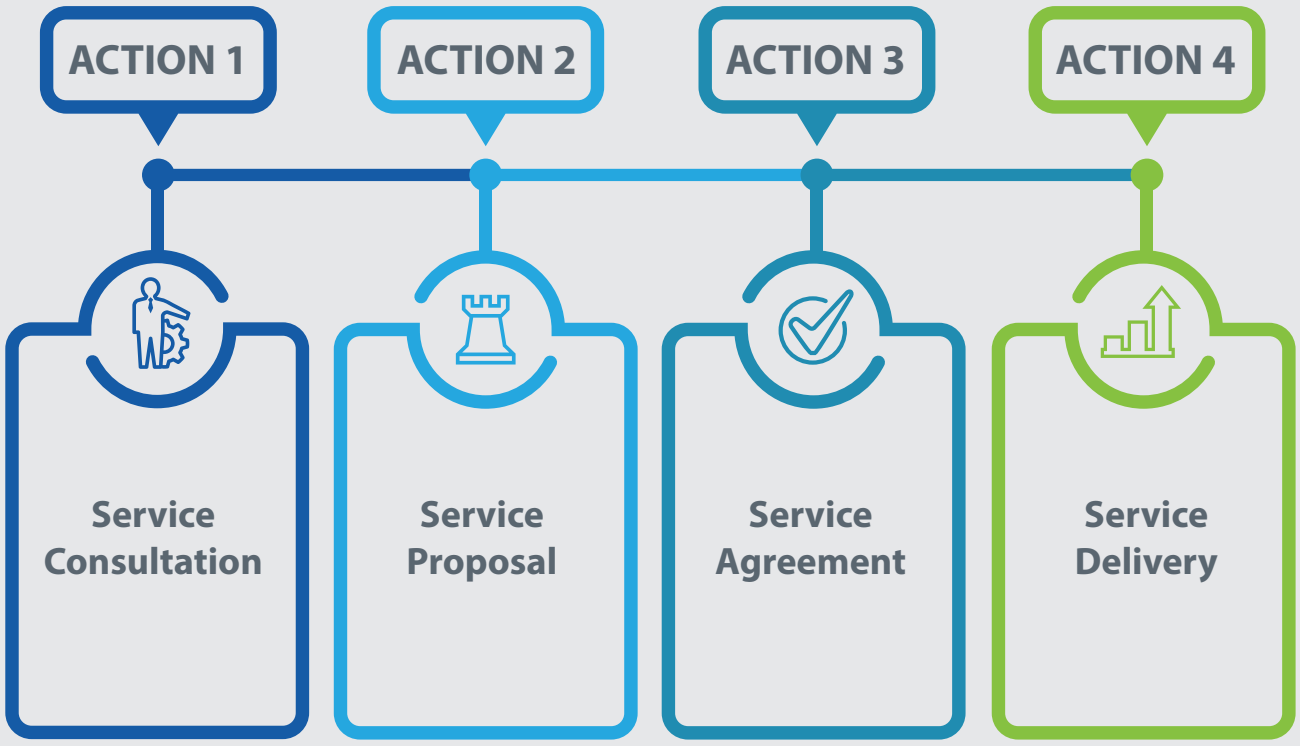


Typical Values Purposes for Performance Verification

The typical value customers see when undertaking a Chiller Performance Verification include:

- To optimise a chiller to obtain maximum performance and energy savings
- To independently verify the capacity of a chiller
- To independently commission a newly installed chiller correctly
- To annually and independently re-commission a chiller
- To measure any annual Drift in overall performance of both the chiller and the associated chilled water system. Particularly the control systems

NEXT Steps



Birdsall

Building Services · HVAC Services
Energy Services · Project Services

www.birdsall.co.uk

Hemel Hempstead - Head Office
13 Avebury Court, Mark Road,
Hemel Hempstead,
Hertfordshire HP2 7TA
Tel: 01442 212 501

Romford Office
Unit B3 Seedbed Centre,
Davidson Way, Romford,
Essex RM7 0AZ
Tel: 020 3198 6477

East Grinstead Office
Unit 8 Scandia-Hus Business Park,
Felcourt Road, East Grinstead,
West Sussex RH19 2LP
Tel: 01442 899 543