



Increasing performance, Reducing consumption

Mission Energy in the Data Centre





Half disappears into thin air

Data centres run 365 days a year. In tightly packed server racks, they produce ever increasing computing-power on an ever decreasing surface area – power that is almost entirely converted into heat. Air conditioning technology keeps things running reliably. It conveys heat outside right away. But then, the air conditioning in data centres devours a huge amount of electricity. In the worst cases, it uses more than half of the energy supplied to the data centre.

Too much energy to keep computers cool

STULZ expertise

» Computing produces heat

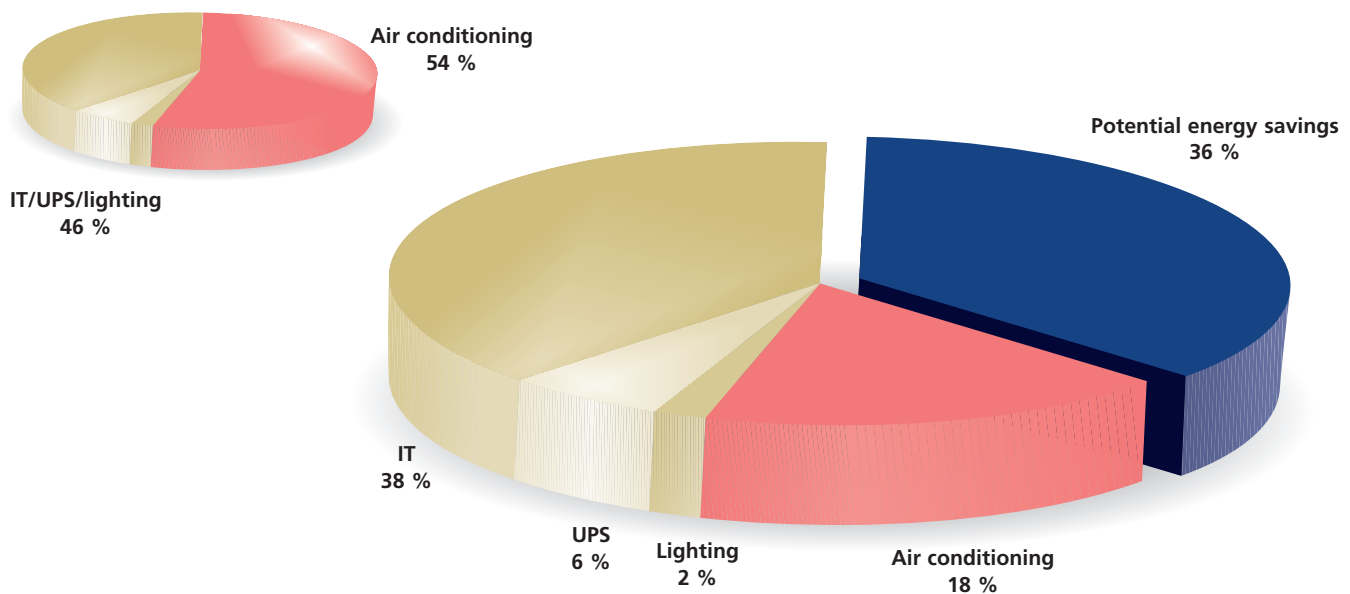
Computers convert almost all the energy supplied to them into heat. The greater their performance, the more heat they emit. Only a small proportion of this energy is needed for the actual work of computing.

As computers only work reliably and well at temperatures of 20 °C to max. 24 °C, they have to be cooled. The more efficient the cooling, the less electricity the data centre needs.

» Each kilowatt counts 8760 times

Modern data centres are in operation year in year out for 8760 hours – 365 days a year, 24 hours a day. Which is why every kilowatt saved has an enormous effect on savings. At a price of 13 eurocents per kilowatt-hour, every kilowatt that is cut means savings of 1,138 euros a year.

Example of energy distribution in a data centre



Energy-efficient optimising, building and operation

For new or optimised systems or running existing ones – choose energy-efficient air conditioning from STULZ. With expert advice, intelligent products and enduring service, we will be there for you throughout the life of your air conditioning system.

Save electricity, increase performance

Gain room for manoeuvre in the management of your operating costs. With energy-efficient precision air conditioning systems, you can cut the power consumption of your data centre by up to 40 %, reducing electrical costs or releasing the saved energy for investment in upgrading and expanding your hardware.

» Cut CO₂ emissions – and save hard cash

Air conditioning a data centre in Berlin with a surface area of 300 square metres and a thermal load of 1 kilowatt per square meter using a free cooling system costs only 49,989 euros a year, compared

with 102,397 euros a year with pure compressor cooling. This is equivalent to savings of 52,408 euros and 237,853 kg of CO₂ per year*.

» Plus 40 % power reserve

With this computing power, modern precision air conditioning systems lower the energy consumption required for cooling computers by up to 40 %.

* Source: STULZ comparison of system costs, basis for calculation 13 ct/kWh



STULZ room tuning: First Aid for your data centre

Room tuning optimises energy yield quickly and effectively. Cover panels and blanking plates, seal gaps in server racks, processor power is evenly distributed, raised floors are free from cable spaghetti, operating values are tuned to an optimum level. The data centre can breathe freely once more. Cooling capacity is put to more effective use, and energy consumption drops.

Getting it right

Be chilled, not be chilly!

Computers are at their best at a supply air temperature of 20 °C to max. 24 °C and 40 % to 55 % relative humidity. When cooling is more powerful, the cooling compressor runs more often, and the air loses humidity. The result? The air conditioning

system dehumidifies the air. If humidity drops below the setpoint, it humidifies it again. Power consumption rises – due to the longer compressor running time and the necessary extra power required for humidifying and dehumidifying.

STULZ expertise

» Fine-tuning from the air conditioning experts

Thermodynamics in the data centre is a complicated affair. There are many routes to greater energy efficiency.

Our experts will help you with a thorough analysis and informed advice.

» Freeing the airways in the raised floor

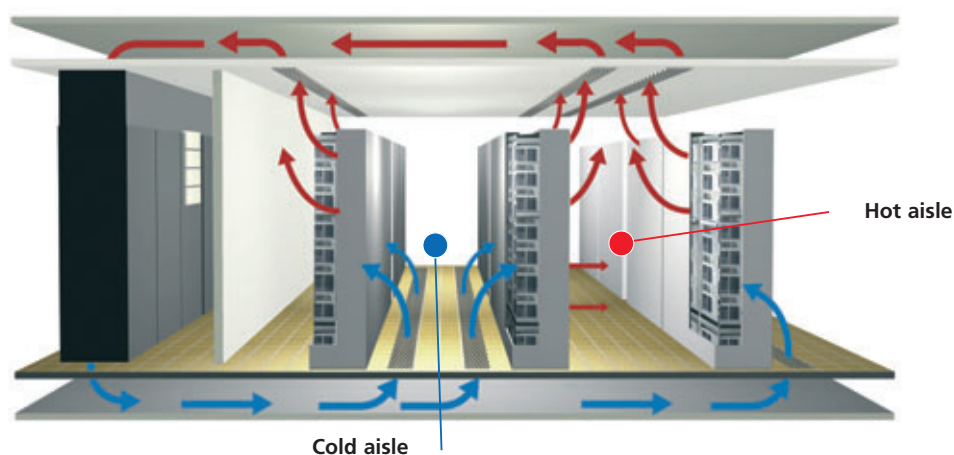
In most data centres, the cooled air is conveyed to the server rack through raised floors. Surplus or redundant cables and awkward pipework installations impede the air flow and reduce the cooling effect. With a bit of tidying up, you will achieve a noticeable improvement.

Traffic jams in the air flow

For optimum air distribution, data centres are divided into hot and cold aisles. The cold aisle conveys cooled supply air through the raised floor to the front of the server racks. In the hot aisle, heated discharge air flows back to the air conditioning unit. If the air flow is blocked or misdirected, the cooling effect is diminished – and power consumption rises. This is caused by raised floors clogged up with cables, short circuits of air in server racks, and an incorrectly set room temperature.

Hotspots

Often, planning of an air conditioning system is based on the assumption that heat is distributed evenly. But the reality is different: heat from high-powered computers and misdirected cooling air lead to so-called hotspots. If the thermal load on site lies above the planned average, not enough cold air gets to the computer. Simply reducing the set-point temperature not only has a negative impact on cooling capacity but also results in considerable extra power consumption. The hot-spot remains because the airflow is ineffective.



» Layout plan for server racks

Distribute computer power evenly between all server racks. A layout plan increases operational reliability and reduces the risk of hotspots.

» Cover panels for unused height units

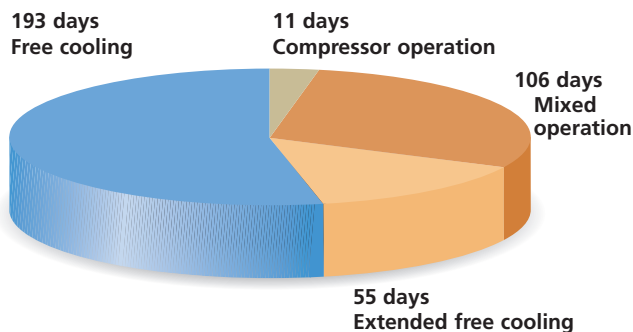
Air always finds the path of least resistance. So seal unoccupied height units in the server racks with blanking panels, so that the cooled air flows through the

server – not past it. In this way, you will avoid short cycling of the air path, where the heated return air is drawn back into the front of the Server.

Plan well, cool efficiently

Free cooling with outside air

Thrifty precision air conditioning systems also make use of cool outside air for the indirect cooling of the data centre. Modern control electronics only switch on energy-intensive compressor cooling when really necessary. The data centre environment is continually monitored and the ideal operating mode is instantaneously selected.



Source: STULZ calculation of system costs, location Nuremberg

New buildings without compromise

Energy-efficiency is a question of planning. In new buildings, you can design the air conditioning system to the specific requirements of the room and computing equipment with particular precision. Many possible systems exist, but only one solution will provide optimum energy-efficiency for you. We will be glad to help you choose the right one.

Spot-on cooling with water

Where high-powered computers produce local hotspots, chilled water goes to the heart of the problem and dissipates the heat. Liquid-cooled server racks work especially efficiently in these cases. All water-bearing parts are strictly separated from the electronics.

STULZ expertise

» Why precision air conditioning systems?

Precision air conditioning systems are designed for continuous operation in data centres and telecommunication systems. Unlike conventional 'comfort' air conditioning units, the sensible cooling power of precision air conditioning systems is

considerably higher – which means that more than 95 % of the energy is used for cooling the room temperature. The air is circulated three times faster, the temperature and humidity are maintained with utmost accuracy.

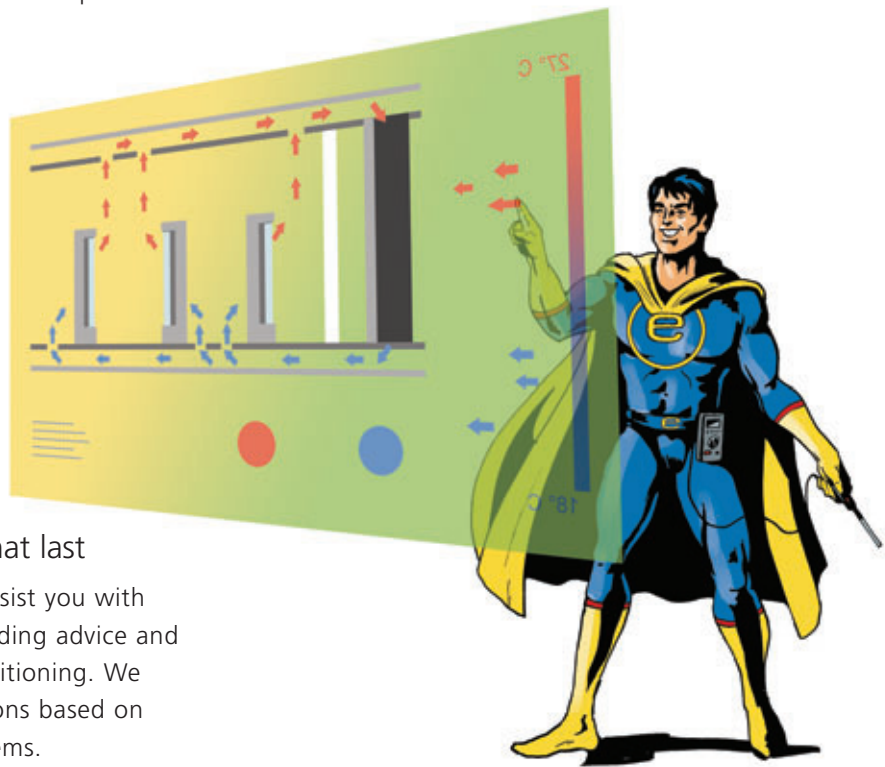
» Plan scalability in good time

Computers are generally replaced every 4 years at the latest, whereas air conditioning systems have a considerably longer life. When planning your new building, leave room for additional pipes, connections, interfaces and equipment for future expansion. In this way can you ensure that your computers and air conditioning system can work together efficiently and grow together far into the future.

Cool air guided with precision

In order to ensure that the cooled air gets to where it's needed, careful planning of the air distribution is an important part of every good air conditioning project. Hot and cold aisles, raised floors and cover panels convey the cooled air to the computer with precision.

Particularly efficient systems make use of closed air circuits, for example, which feed the waste heat from the server racks directly back to the air conditioning unit via closed air ducts.



Advice from STULZ: Solutions that last

STULZ air conditioning experts can assist you with the planning of data centres by providing advice and products for energy-efficient air conditioning. We develop tailored energy saving solutions based on STULZ precision air conditioning systems.

» Energy-efficient free cooling to 18 °C

Invest in free cooling. This especially economical cooling system functions at moderate outside temperatures of up to 18 °C. Free cooling does not need an energy-intensive compressor – it makes use of the natural temperature difference between cool outside air and hot discharge air from the data centre.

» Energy sappers in the system

The operation of cooling compressors and fans in the air conditioning system is particularly energy-intensive. Electronic control improves response in changing load conditions, while additional cooling with indirect free cooling keeps the running time of the compressor to a minimum.

» Well-insulated premises

For your data centre, choose heat-insulated rooms without direct sunlight – ideally without windows, on the side of the building facing away from the sun. Examine the possibility of heat recovery – for heating offices, for example, or industrial water.

Energy-saving technology

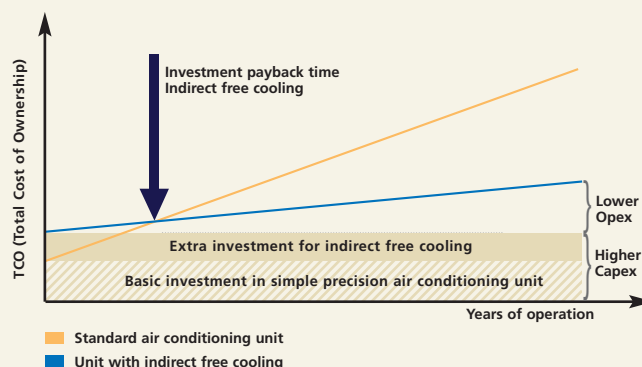
Low consumption over large areas

Large data centres are cooled by the low-consumption STULZ CyberAir® precision air conditioning system with DFC. The DFC (=Dynamic Free Cooling) automatic air conditioning system controls the output of the cooling fans in the blink of an eye, and switches to economical

free cooling when weather conditions cool down. In this operating mode, the refrigerant in the system is further cooled with outside air. Energy-intensive compressor cooling (DX) is only switched on when absolutely necessary.



STULZ expertise

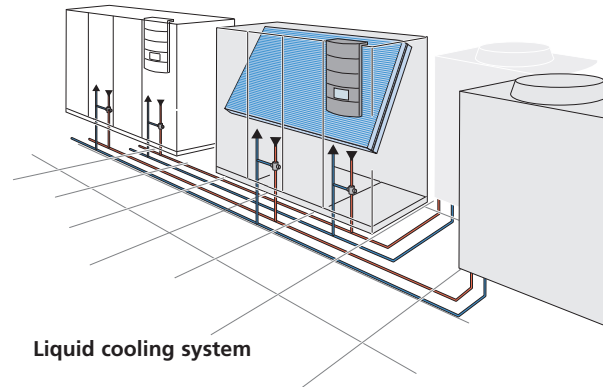


» Energy-efficiency pays

In view of rising energy prices, the investment in a STULZ precision air conditioning system with energy-saving technology pays for itself in just a few years.

Chilled water instead of a compressor

In data centres with a thermal load of approx. 800 kilowatts or more, cooling the circulating air with water is a viable option. The cooling circuit is fed by an external chilled water generator. Liquid cooling systems supplemented by economical free cooling are particularly energy-efficient. Their investment payback times vary depending on the climatic conditions at the site in question. Your STULZ expert adviser will carry out TCO (=Total Cost of Ownership) calculations to assist you with your decision.



Efficient supplementary cooling with chilled water

In combination with liquid-cooled server racks, STULZ CyberCool produces chilled water for the direct cooling of high heat-density server racks.

» Fan with EC fan technology

Electronically controlled EC fans run particularly efficiently in partial load mode. They react steplessly to changing cooling load requirements and deliver precisely the air flow that is needed.

» Low Cost indirect free cooling

Precision air conditioning systems with indirect free cooling make additional use of outside air for room cooling. Cold outside air cools the refrigerant by means of a heat exchanger.



Economy in operation

STULZ Service: Look ahead with an energy audit

Through its knowledgeable service team STULZ will ensure that energy efficiency remains a strategic objective. The STULZ energy audit regularly checks the energy performance of your precision air conditioning system. If measured values deviate from the setpoints, your air conditioning system is recalibrated. If the cooling

power is no longer sufficient, STULZ Service identifies the causes and makes suggestions for a system upgrade. As a competent partner for IT and facility management, we are at your side as you tackle these tasks.

STULZ expertise

» Management of air distribution

A new rack installed here, an old server taken out there – empty slide-in units in the server rack bring a state of confusion to the passage of air between cold and hot aisles. The cooled air does not flow

through the server, but through unoccupied height units in the rack, leading to short circuits in the air. Therefore, you should always seal empty slide-in units with cover panels.

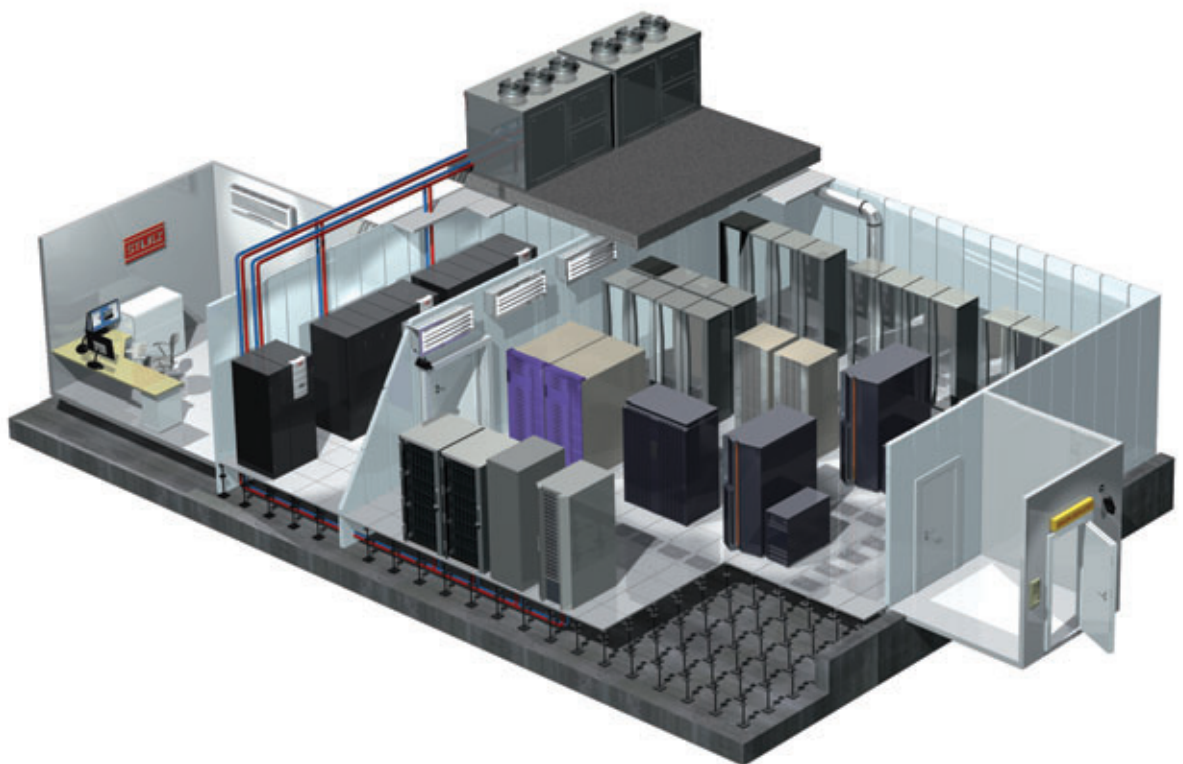
» Distributing power evenly

Plan the occupancy of your server racks meticulously. The more evenly the processor power is distributed over the room area, the more effective air conditioning will be. The best results are achieved when IT and facility management work closely together.

A living IT landscape

During operation, the climate is constantly in motion. Like any technical system, air conditioning systems in the data centre need regular maintenance. And when individual computers or racks are enhanced, converted or replaced by higher-powered equipment, this

becomes critical. For each new heat source changes the thermal load distribution, each new piece of hardware can force the flows of hot and cold air out of balance.

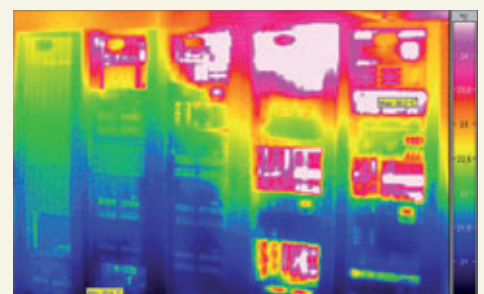


» Lay cables tidily

As each new computer or server is connected the result is a colourful tangle of wiring harnesses. In the raised floor, they block the flow of air. STULZ assists you by offering suggestions for systematic cable management.

» Climate map with thermographic imaging

A thermographic image renders hot and cold zones in the data centre visible, as on a weather map. In this way, you have an early warning system of conditions in the air conditioning system that may increase consumption.



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