

1&1 Internet AG computer centre

100% operational reliability



Line of Business:	Air conditioning
Application:	Air conditioning
Country / City:	Germany / Baden-Baden
Fluid:	Water, Glycol
Product:	Condenser GVW (W-shape)

1&1 Internet AG, one of the world's biggest Internet providers, was looking for a system to cool its computer centre in the Baden-Baden area. The centre was designed to be a central hub in international data communications and requires 100% operational reliability.

The location of the new computer centre is a former army bunker, which combines the space that is required for a total of 80,000 Internet computers with the necessary discretion. As well as the indispensable cooling systems, the systems engineering that is required to operate the new computer centre includes emergency power equipment and fluid cooling systems that are all going to be installed on the roof of the computer centre. Careful consideration must therefore be given to the size of the machinery during planning.

24/7 Internet

A second task that was required was to provide the necessary operational reliability. Failure of the cooling system or the other equipment that is needed to maintain operation could cause a collapse of European Internet services. The current supply level of 99.9% is therefore inadequate in this case. Even the slightest failure would mean more than 3 days loss of Internet service when interpolated over a year. This is not acceptable for a well-known Web hoster such as 1&1 Internet AG.



The Combitherm solution

1&1 Internet AG commissioned Combitherm GmbH, a manufacturer of refrigeration systems and heat pumps with special focus on the construction of special systems, and a Karlsruhe planning office to design the refrigeration system. The operational reliability for the new project was defined at 100% all year round - a value that Combitherm had already successfully implemented during the equipping of another computer centre. Top priority was also given to economic viability, which can contribute to giving a provider the edge in extremely competitive markets such as Internet providing.



Front view of refrigeration machine

Flexibility up to 10,000 kW

The client defined a cooling requirement of 8,000 to 10,000 kW upon completion, which was to be implemented in three development stages. Because of the dynamic developments in the Internet market and new developments in server technology, the aim was to find a system that was as flexible and adaptable as possible that could meet all future requirements. With regard to cooling generation, only cooling machines with screw or turbo compressors would come into question in a system of this magnitude. Since water circuits with glycol filling are not usually the equipment of choice in computer centres, cooling distribution using nothing but water was defined to begin with, which would supply the server rooms with the required cooling. For fluid cooling the planners favoured a dry solution in order to circumvent the problem of supplying fresh water because of the location of the computer centre, and to prevent soiling caused by pollen and leaves in the vicinity of the computer centre.



Delivery of the condensers

Operational reliability and economic viability

In order to achieve the best possible operational reliability, 1&1 required three completely independent cold water circuits for the computer centre cooling system. A great deal of value was also put on operational reliability inside the systems. If a refrigeration machine fails, there is still a considerable amount of remaining capacity. In order to ensure that the solution was also impregnable as far as CO₂ is concerned, additionally to the air-cooled chillers, dry open air coolers that supported the chillers with extremely high efficiency via an intermediate glycol circuit from about 10 °C were also used. This meant that a solution had been found that optimised both operational reliability and economic viability with acceptable investment costs.

V-shaped condenser from Güntner

Combitherm implemented the concept with three chillers with output of 900 kW each, and each machine had two screw compressors, two compact stainless steel plate heat exchangers with assigned cold water pump, and a con-

denser that had been specially developed for this application by Güntner. Since a limited amount of space was available, Güntner adapted its development of the GVW V-shaped condenser to the planned spatial layout in an optimum way: The GVW combines a compact design with a high nominal output and achieves about 50% more output than comparable condensers in relation to the area. Another advantage: the GVW provides a high level of operational safety because it is equipped with the proven Güntner floating coil principle.

Optimum availability

Combitherm installed the entire cooling circuit, the switch cabinet and the fully heated hydraulics on the second floor. The entire capacity is distributed via three completely independent water circuits from the start, whereby a refrigeration machine with two refrigeration, hydraulic and electrical circuits for each water circuit is used at each stage of development. Each water circuit therefore has additional redundancy incorporated in it. After the units had operated for one year with 100% availability, the second development stage was implemented with three refrigeration machines: Ideal prerequisites for successful further expansion of the computer centre with free coolers and refrigeration machines.