Güntner cools US power grid

So that no more blackouts occur

Anlagenbau Neundörfer: Industrial cooling model specialist

Line of Business:	EPC
Application:	Energy and Process Cooling
Country / City:	USA / New Orleans
Fluid:	Water, Glycol
Product:	Drycooler GFH

About 1.5 percent of the throughput in a power grid is lost in power conversion rectifiers in the form of heat. This heat loss must be removed into the surrounding air via a liquid circuit – reliably and with as little operating current use as possible. Anlagenbau Neundörfer has developed a modular cooling system to do this that meets the extremely demanding requirements of current transfer systems. There are many reasons why Neundörfer nearly always uses Güntner drycoolers in these cases. Managing director Bernhard Neundörfer puts it simply: “Everything is simply right at Güntner: Quality, delivery date and technical advice”.

Cheaper, quieter, more compact and more efficient than US products: Güntner drycoolers in a cooling unit built by Anlagenbau Neundörfer for Siemens PTD

Since the blackout on the US east coast and parts of Canada on 14th August 2003, American energy suppliers and network operators have been forced into investing in modernising their power supply systems again. Unlike Germany, where improving efficiency is an important issue during the course of modernisation, in the USA the prime objective is preventing failures and improving the operational availability of the networks. In the USA it is usually the case that investment only takes place if it produces an adequate return. The wave of modernisation in the US power and power station network that was hoped for after the blackout in 2003 has therefore been slow in coming. As well as extending and modernising the power stations, modernisation of the power conversion plants also plays an important part in safeguarding the power supply, as experts consider these plants to be one of the weakest links in the chain from the power station to the end consumer.

The fact that the German power station and network technology know-how is in increasing demand in the US market is shown by the example of Louisiana, where Siemens Power Transmission & Distribution (PTD) erected a new substation nine miles upstream of New Orleans on behalf of the Entergy Corporation, which is why it is known as “Nine Mile Substation”. According to the client, the objective of the investment is to improve the availability and capacity of the network and stabilise the voltage in the capacitive area with the aid of so-called TSC Rectifiers (TSC = Thyristor Switch Compensator).

Reliable heat removal

At the Nine Mile project about 680 kW of heat occurs in the rectifiers because of heat generation, which has to be removed reliably, -efficiently, with low maintenance and with as little operating current consumption as possible for 365 days a year. Siemens PTD, who put together the project ready for operation together with Beta Engineering, LLC of Pineville, LA, awarded the entire cooling system to Anlagenbau Neundörfer GmbH, which had already been the case on many similar projects worldwide. Bernhard Neundörfer: “Because of inquiries from different industries we developed a modular industrial cooling system as a kind of construction kit that we can adapt to the -relevant cooling process”.

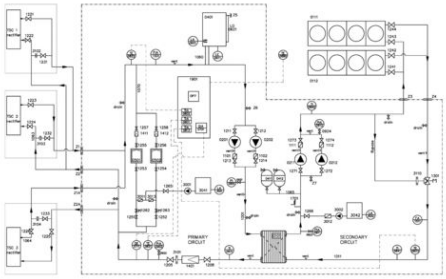
Cooling module built using construction kit system

The cooling system for the rectifiers and converters consists of two circuits: The primary circuit, which was filled with fully demineralised water and ion exchangers for ensuring that the electrical conductivity was at least 0.2 mS/cm, and the secondary circuit for the actual removal of the heat loss into the atmosphere.

Cooling module manufacture for all rectifier and converter types at Anlagenbau Neundörfer GmbH

Responsible for the management of the "Nine Mile" project at Neundörfer: Mechanical engineer Ingrid Boscher

The system was split into two circuits because the clean water circuit makes extremely high demands of the pipe material that is used, the fittings (both stainless steel) and the measuring technology, whereas standard materials and standard products can be used for the secondary circuit. At the same time it must be ensured that no condensation occurs on the pipes in the primary circuit, i.e. no water can drip off them. Both circuits are equipped with dual pumps in order to provide availability under any circumstances. Automatic backfeeding equipment is installed in both circuits so that the systems do not have to be supervised. At the secondary side the circuit is filled with a glycol/water mixture in order to ensure that the system operates reliably in winter. Because there is a three-way valve installed in the secondary circuit, the circuit can also be "warmed up" at extremely low outside temperatures, i.e. the water/air heat exchangers are run until the minimum operating temperature of 10 °C is reached. The cooling system is operated in such a way that the intrinsic power consumption is as low as possible.



Cooling unit diagram for rectifiers in the Nine Mile conversion plant in New Orleans

As far as the incorporation of the four air/water heat exchangers (Güntner S-GFH 090.1 D/4-N-F6/3P) is concerned, this means that the temperature in the primary circuit is kept as close as possible to the maximum temperature of 45 °C and additional fans are not switched on until this limit temperature is exceeded. The large number of fans in the drycoolers (4 x 4 axial fans including two spares in the Nine Mile system) allows the heat removal to be almost continuously adapted to the rectifier heat emission.

Addendum

The Nine Mile conversion plant was switched off for safety reasons during the "Katrina" and "Rita" hurricanes. The plant survived both hurricanes and is expected to go back online at the beginning of October.

"Way ahead of US manufacturers"

We asked Bernhard Neundörfer, who also knows the competitor products on the US - market, why drycoolers from Europe were being used in the land of power air conditioning systems, high-tech foundries and return optimisers. "Firstly, US components are more expensive and bulkier, because they are manufactured differently", he explains. And external rotor motors such as the ones used by Güntner as fan motors are almost unknown to US

fan manufacturers. “The equipment isn’t really comparable. This applies to both the overall structure and the structure of the fins on the heat exchangers. Güntner is way ahead of US manufacturers in this area”.

Bernhard Neundörfer: “Everything is simply right at Güntner, the product, the logistics and the chemistry”.

The reason why Neundörfer used Güntner drycoolers almost exclusively is simple. “Everything simply fits together: The design, the recalculations, the quality, the reliability and the human element”, says the globally operating system builder. He also said that the reliable delivery was hard to beat. “I don’t want to have to chase suppliers when international orders have been placed. I know that I can rely 100 % on Güntner’s logistics”. Neundörfer also appreciates the fact that he has been looked after by the same sales partner for 15 years in Güntner. “The heat exchanger business is a matter of trust. The chemistry between the business partners must be right".

No energy transfer without cooling

In the past, preference was always given to high-voltage direct current transfers (HGUs) when current was being transmitted over long distances, or if networks with different power levels were interconnected. If the same power level was transferred in an interconnected network via three-phase current, severe load fluctuations would occur, leading to grid instability. In an HGU transfer, current rectifiers are used at the beginning and end that can be operated as controlled rectifiers or converters. These rectifiers or converters convert about 1.5 percent of the conducted electrical power into heat.

The USA after the blackout of August 2003: Investments are only made if they provide a return

The USA, the high-tech superpower, has a power grid that belongs in a third world country. This was said by the former energy minister of the Clinton government, Bill Richardson, when the lights went out in eight east coast states in the USA and parts of Canada within two hours during the spectacular blackout on 14th August 2003. About 50 million people between Cleveland, Ohio, Michigan and New York were affected. According to experts, the “blame” was not just the failure of a power station in Ohio and the short-circuiting of an overland line as a result of overloading or a cable coming into contact with a tree due to stretching, but - primarily the ancient network and certain circuit breakers that were installed back in the 70’s. Experts estimated the cost of replacing the equipment in the blackout region to be about 50 billion dollars, but only about 2 billion dollars per annum were being invested in modernising the grids (status in 2000). As far as the VDE (Electrical Engineering, Electronics and Information Technology Association) was concerned, the blackout in the USA was predictable, because after the deregulation of the US power economy in the 1990’s no money was invested in new power stations or network modernisation. Extremely long cables of 100 to 1500 km are typical of the USA, whereas in Europe they are normally between 50 and 300 km. The situation is made worse by the fact that the US power supply is only divided into four regions, between which there is little transfer capacity. According to a statement by the PTD area (Power Transmission and Distribution) at Siemens in the VDI news after the blackout, not much will change in this situation in the foreseeable future. “The determining factor is the insistence on making a return”, says Siemens PTD.