# Hospital makes use of efficient water and energy input for cooling

**It is not all about investment costs when it comes to the „right“ dry cooling technology. This is why the Fürstenfeldbruck Hospital in Germany calculated very tightly, and the persons in charge opted for the adiabatic state-of-the-art *ADC* dry coolers from JAEGGI as the life cycle costs were ultimately decisive for the investment. Yet the recently installed units offer another advantage: Due to their design, the low-maintenance JAEGGI *ADC* dry coolers do not fall within national relevant regulations but meet the stringent requirement of the German VDI guideline 2047-2 and also comply fully with ACOP L8 and HSG274 Part 1.**

The setup conditions for dry coolers on top of the roof of the Fürstenfeldbruck Hospital are everything but ideal: The installation site on the 6th floor is restricted, and a two-metre high balustrade and an annex on one side respectively serve as screen wall surrounding the installation „balcony“. And at the annex, there is an outlet of the air handling unit discharging approx. 25 °C/77 °F hot air from the operating theaters in the direction of the „balcony“ all year round.

## Overview

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| Business line: | Air conditioning |
| Application: | Machine cooling |
| Country/Region: | Germany/Fürstenfeldbruck |
| Fluid: | Germany/Fürstenfeldbruck |
| Product: | JAEGGI ADC |

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▲ When the waste heat of the CHP is not required for the raw water and heating during summer, it is used as energy source for the absorption chiller

▲ The new, durable JAEGGI *ADC* dry coolers dissipate the non-usable heat of the absorption machines as well as the non-usable heat of both compact refrigeration plants to the outside air.

## CHP and absorption machine

The Fürstenfeldbruck Hospital produces electrical power (1,874 MWh/6,389 MMBTU) from natural gas as primary energy source by means of a cogeneration unit and a connected absorption machine. Heat (3,188 MWh/10,870 MMBTU) and cold (697 MWh/2,376 MMBTU) are generated as well: The heat is used for the raw water and the heating during winter, and the cold is supplied for the generation of cold water used to air-condition the air handling units and to cool the medical equipment in the summer months.

When the waste heat of the CHP is not required for the raw water and heating during summer, it is used as energy source for the absorption chiller. And if the absorber cannot fully cover the cold requirement in summer, the water-cooled cold water generator will provide the „rest“. In pure winter operation, the CHP‘s heat is transferred exclusively to the heating and the raw water, and it is only the water chiller that supplies cold for the water chiller system. The total refrigeration load is 1,193 MWh/4,071 MMBTU per year.

Thanks to this supply engineering solution, the hospital is relatively independent of external electricity providers and also saves primary energy for water heating and electricity costs for refrigeration.

## Steadily increasing dry cooling demand

The hospital‘s cooling demand has steadily increased during the past few years. This is due to the fact that the hospital technology as well as the IT structure of the Academic Teaching Hospital of the LMU University of Munich have continuously been expanded. These are the objects that require cooling: The IT infrastructure and the operating theaters, the diagnostic technology such as the MRI (magnetic resonance imaging) and also laboratories, engineering rooms, radiology, and so on.

Before issuing the invitation to tender, it was already evident that the cooling capacity on the „balcony“, packed with twenty-year-old Güntner flat bed coolers (4 x 130 kW/4 x 444 MBTU/h), was no longer sufficient. In addition, the refrigerating plant in the machine room did no longer operate reliably so that a completely new concept was called for. This concept was drawn up by Ebert Engineering Office from Nuremberg, Germany. Within the framework of an invitation to tender, the German refrigeration engineer Dresdner Kühlanlagenbau (DKA) was awarded the contract to supply and install the new cooling technology.

Originally, a different manufacturer was considered in the functional description. Due to decades of close cooperation with Güntner and its reliable products though, DKA chose Güntner‘s sister company JAEGGI. Besides quality, the operators were also persuaded by the new concept established on this basis.

## Twice as much cooling capacity

The new technology had to meet the following specifications: The system temperature of the refrigeration network is to be 6/12 °C (42.8/53.6 °F) with cooling temperatures of 30/36 °C (86/96.8 °F). Several different hybrid systems came into question that were all very different from one another regarding capacity and operating costs. Another requirement was to use the existing concrete base for anchoring the new technology.

In the end, two JAEGGI *ADC* dry coolers with a capacity of 500 kW/1,706 MBTU/h each were installed. These were anchored with the floor structure via separate steel frames as the old concrete bases are shorter than the dry coolers. With a sound insulation mat in between, the steel frames are screwed to the concrete bases, and the JAEGGI *ADC* units in turn, placed on sound insulation legs, are mounted on the steel frames.

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▲ Both JAEGGI *ADC* dry cooling units, connected in parallel, are controlled via a Güntner Motor Management system as well as a Hydro Management system and a superordinate Güntner Master Panel that is connected to the building management system.

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## Efficient use of energy and water

The new, durable JAEGGI *ADC* dry coolers dissipate the non-usable heat of the absorption machines as well as the non-usable heat of both compact refrigeration plants to the outside air. The operators are highly impressed by the low energy consumption of the dry coolers, owing to the exceptionally efficient EC fans, and by the low water consumption of the two JAEGGI dry coolers and the intelligent control. These three factors result in significantly reduced life cycle costs.

Due to the climatic conditions in Upper Bavaria, the operators expect the units to run in wet operation during only about 350 hours per year at maximum cooling capacity – when external temperatures exceed approx 24 °C/75.2 °F. With regard to water consumption, this implies that 364 m³/12,855 ft³ of fresh water would be used and 244 m³/8,617 ft³ of waste water would be drained per day at max. cooling capacity during 24 h of operation (one third of fresh water evaporates). Adiabatic pre-cooling is achieved via humidification pads that are arranged at a certain angle prior to the heat exchanger.

## Superordinate control for economic operation

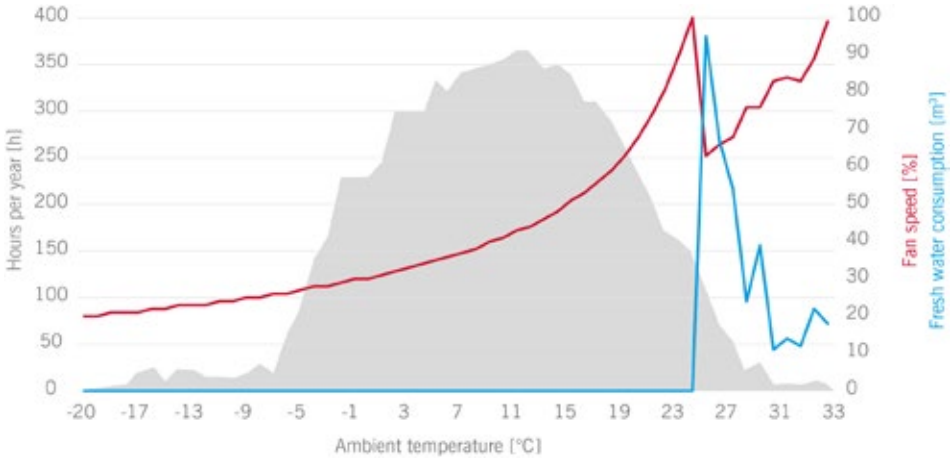
Both JAEGGI *ADC* dry cooling units, connected in parallel, are controlled via a Güntner Motor Management system as well as a Hydro Management system and a superordinate Güntner Master Panel (GMP) that is connected to the building management system.

Depending on the external temperature, the setpoint setting is adjusted continuously via the GMP to ensure energetically optimised operations of the two dry coolers. When the external temperature rises, it may be above the setpoint. Under these operating conditions, the fans would always run at maximum speed.

The continuous setpoint displacement (between 24 and 30 °C/75.2 and 86 °F) by the Master Panel allows to reduce the energy consumption of the fans. The Güntner Master Panel was integrated into an existing control cabinet with completely new wiring. Besides its positive properties as a control tool, the GMP offers the advantage that every operating parameter can be visualised. Without the panel, a greater constructive effort would be necessary to use this feature.

## Green light regarding environmental legislation

The JAEGGI *ADC* dry coolers comply with the sound requirements according to the German Technical Instructions on Noise Abatement („TA Lärm“) for hospitals – 45 dB (A) in the daytime and 35 dB (A) during the night at the place of immission. Due to their




▲ Water supply is required only during a few hours in the course of a year. It immediately reduces the fan speed. This is because adiabatic pre-cooling lowers the temperature level of the air as the water in the pads evaporates, thereby removing energy form the ambient air.

design, the dry coolers are not subject to national relevant regulations but still meet the requirements of the German VDI 2047-2 guideline. The units also comply fully with ACOP L8 and HSG274 Part 1 if used properly. The installation site on top of the roof was classified as „closed tray“ in the framework of the German Ordinance on facilities for handling substances that are hazardous to water (German designation: AwSV) so that the excess water and the drained water can be discharged via the existing sewer.

The operators also appreciated the short disassembly and installation times and that everything went smoothly.

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