Hybrid cooling on the rise

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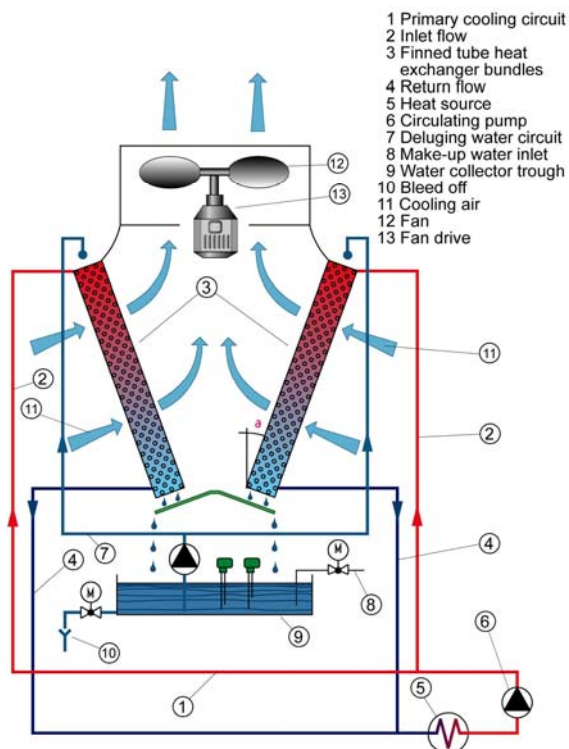## Hybrid is "in" - not only in the automotive sector

The topic of hybrid technology is currently driving the car industry, with all the leading manufacturers presenting environmentally friendly vehicles with Hybrid drive, i.e. a combination of electric and internal combustion engine.

The Swiss firm Jaeggi has been developing hybrids since the 1990s as a new and sustainable cooling system. Through their innovative hybrid technology, Jaeggi has succeeded in combining the energy efficient principle of natural evaporative cooling with water-saving dry air-cooling in one device.

Hybrid Cooler – reduces energy use, saves water, is plume free and very quiet

The Jaeggi hybrid dry cooler combines the advantages of conventional dry cooling and wet cooling, without their disadvantages. Thus, customers get high-efficiency cooling technology with minimal power and water consumption.
In addition, the coolers are extremely quiet and are guaranteed free from visible vapour plumes. Due to the integrated HybriMatic ® control and a compact design, hybrid coolers are easily installed into existing or new installations.

1 Primary cooling circuit
2 Inlet flow
3 Finned tube heat exchanger bundles
4 Return flow
5 Heat source
6 Circulating pump
7 Deluging water circuit
8 Make-up water inlet
9 Water collector trough
10 Bleed off
11 Cooling air
12 Fan
13 Fan drive

Function principle of hybrid cooler
Jaeggi/Guentner (Schweiz) AG

Focus on energy efficiency and water conservation

Hybrid coolers are optimised for water-saving: during colder annual hours, or at part-load operation, the cooler is controlled by the Jaeggi HybriMatic ® control to operate dry, ie with convective heat transfer to the ambient air. Only when the required return water temperature cannot be achieved by dry-cooling is the wetted mode automatically activated. Although the cooler then works through natural, energy-efficient evaporation, it saves 70-90% of annual water consumption as compared to wet cooling towers, and proportionately reduces the associated operating costs.

Typical operation: dry cooling hours
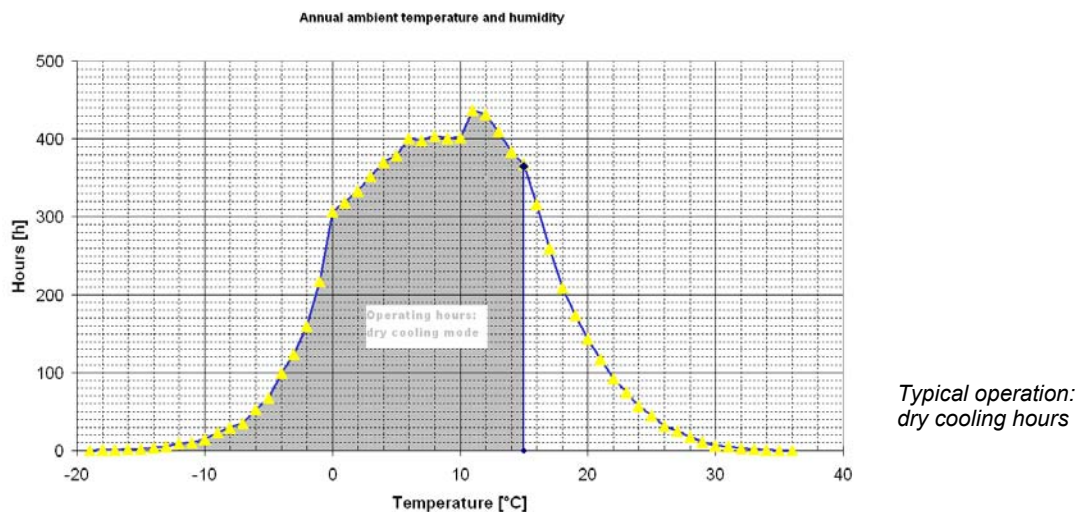
In multiple cooler installations, the wetting mode is actuated progressively across the coolers as the ambient temperature rises, so that the period of fully evaporative operation is limited to only a few operating hours each year.

Energy consumption is minimised through the use of axial fans with inverter speed control and electrical motors with class Eff1 energy efficiency.

Jaeggi has continued to develop the patented hybrid dry cooler since 1991 with around 1800 installations in Europe. The innovative Swiss-engineered high-tech product is successfully used in many diverse applications; such as heat rejection for air conditioning/climate control or in industry to produce cooling water.

Hybrid coolers are available in various sizes for cooling capacities of 100 - 3,500 kW per unit, and are increasingly used to replace installations with wet cooling towers or dry coolers.

Hybrid cooling systems in building services

In building services, the hybrid dry cooler is a heat rejection system for the condenser in water-cooled chillers (turbo, rotary screw, reciprocating compressors or absorbers) that provide chilled water for air conditioning of buildings, clean rooms or data centres.

Hybrid coolers for air conditioning of computer and server rooms of a telecommunications company

Higher COP values of the chillers are realised through lower cooling water temperatures, because the compressors require around 3% less energy for each 1°C lower condensing temperature. At lower outdoor ambient temperatures, or at partial load, the cooler in "free cooling mode" can replace the energy-intensive refrigeration compressors, thus improving the energy efficiency of the entire system.

Hybrid cooler for a Data centre for SAP

Hybrid coolers for industrial cooling

In many industries the waste heat from machinery or process equipment must be removed, if no options for heat recovery are available.
When low cooling water temperatures are needed below the wet bulb temperature, such as in the plastics industry for cooling the moulding machines, refrigeration chillers are used. The cooling of the condenser circuit can then be advantageously provided through hybrid dry coolers.

Hybrid coolers in use at an automobile manufacturer for Dynamometer cooling

Often however, no chillers are necessary when the process needs cooling water at a temperature of 25°C or higher. Then the hybrid dry cooler can be used directly for the machine cooling. Examples include providing cooling water for air compressors, hydraulic power units, presses, welding machines, autoclaves, test stands, laser cooling, etc.

Process cooling in the Pharmaceutical industry

Since the hybrid dry cooler, in contrast to an open wet cooling tower, is a closed circuit cooling system, it may also be used to directly cool different media such as Kerosene or thermal oil without interposing a plate heat exchanger and without transmission losses.

Use as Hybrid condenser

Following the successful introduction of hybrid dry coolers, Jaeggi has also developed and patented the hybrid technology for the condensing of refrigerants as an alternative to traditional air-cooled condensers or evaporative condensers.
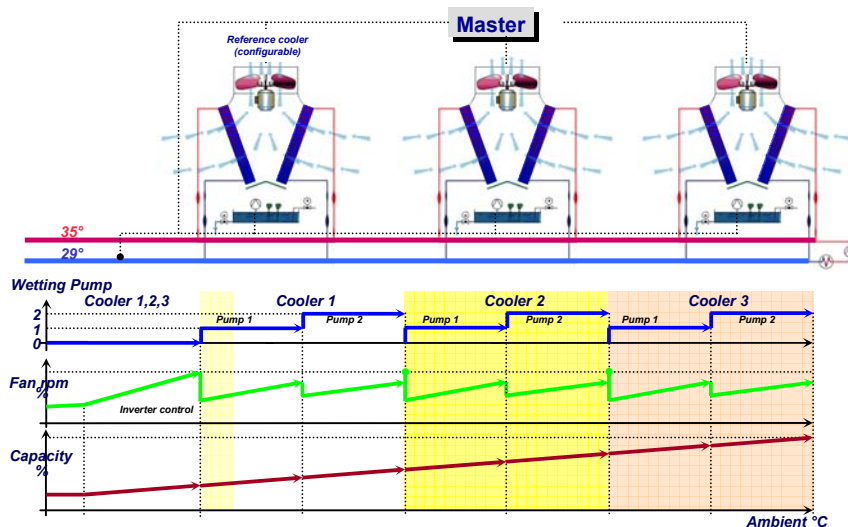
Hybrid condensers are very efficient, with minimal water and electricity use. They also guarantee no visible vapour plumes and are very quiet due to absence of water splashing noise. The hybrid condensers are available for all common refrigerants.

The construction is essentially the same as for the hybrid dry cooler, but for high refrigerant gas temperatures an integral hot gas cooler / desuperheater is provided.

Hybrid condenser with desuperheater for Ammonia refrigeration in food industry

Hybrid technology with its own control

After the granting of patents for both hybrid dry coolers and hybrid condensers, the products have been continuously developed to always be the current state of the art. To ensure optimal operation of the coolers and to realise maximum energy and water savings, Jaeggi has developed its own HybriMatic controller. For composite systems with multiple parallel coolers a networked parent HybriMaster control is used.

Function principle: Master control

Jaeggi emphasises technological leadership

In 2008, the hybrid coolers were independently certified by ILH Berlin to meet all requirements of the applicable European hygiene rules.
In a separate and complex investigation, DMT / TUV also independently tested and verified that Jaeggi Hybrid coolers do not emit aerosols, due to the patented deluging technology. This ensures that, unlike other conventional evaporative systems that work with spray nozzles, hybrid coolers are legionella-safe.

Hygiene Certificate and proof of Aerosol-free operation

Conclusion

Hybrid dry coolers and condensers can be used for various applications in a wide range of operating conditions. Despite higher capital cost than conventional cooling equipment, total life-cycle costs are significantly lower and they pay for themselves very quickly through the saving of energy, water and maintenance costs.

They thereby make an effective and valuable contribution to resource conservation and environmental sustainability.

In addition, the coolers are hygiene certified, operate with very low noise levels, guarantee no visible vapour plumes and operate without aerosol emissions, so making them eminently suitable for installation in all building services or industrial or process cooling applications.

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