Frigel
Intelligent Process Cooling

PRESS RELEASE

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State of art of gas turbine process cooling

Frigel extends its SYNCHRONIZED COOLING concept to the world of gas turbines after having already elevated the "state of the art" in industrial applications of the "plastic" and "beverage" sectors.

SAN BONIFACIO (VR) ITALY – 3 March 2021

The GTAC Process Cooling

The gas turbine performance design values refer to an inlet air temperature of 15˚C (59˚F) and 60% relative humidity. For inlet air temperatures higher than this value, gas turbines degrade their performances due to an unavoidable cause linked to the air flow rate in a volumetric system. **In a very hot installation site, cooling the air entering the turbines is the best way to stabilize their performance and efficiency, as without any corrective action, up to 20% of performance can be lost.**

The concept of this cooling is notoriously effective but complex to implement. The ambient air constitutes the variable load to be satisfied, depending on the flow rate and both on the temperature and on the relative humidity. Regardless of the service required from the turbine which can perform mechanical loads (driving pumps or compressors) or generate electric current (driving electrical generators), in any case, the best possible efficiency is required because the work necessary to cool the air is **in any case to be subtracted from the maximum work that the machine is able to achieve.**

In a world whose "state of the art" is formed by large systems with impressive size chillers, similarly extensive air-cooled heat exchangers and huge water accumulations, **Frigel guarantees the same energy efficiency through an innovative system such as SYNCHRONIZED COOLING.**

Precision Cooling

A network of MULTISTAGE Modular Chiller Units is connected to each other both in cascade and in parallel, according to the needs of the system, to ensure maximum energy efficiency, adequate capacity for regulating the cooling process and extremely rapid functional implementation.

For the correct selection of the system, the finned tube heat exchanger that is placed in the filter chamber is always calculated. Even when this will be supplied by third parties, **our technical support is given because an optimal choice of the exchanger has much of the merit in raising the level of efficiency.**

The control system is designed for the exclusion of the individual modular units (event that can occur due to scheduled maintenance, failure, adjustment), but by modifying the functional parameters of the other units in the network it always ensures that the right temperature level of the air entering the turbine filter chamber is always guaranteed.

Efficiency

The typical turbine installation site does not necessarily have the possibility of having water available for heat rejection (Cooling Towers).

In principle, we tend to use the DRY type of air heat exchange system. Aware that the DRY system implicitly has limits regarding maximum efficiency, **Frigel introduces the ECODRY system for the dissipation of heat from chillers.**

This system can operate in DRY mode when a partial cooling capacity is required (low ambient temperatures mean having low loads) and the efficiency remains high thanks to the generous design of the heat exchangers. When the ambient temperatures tend to increase, condensation water begins to be produced by the coolers in the filter chamber. The ECODRY system collects this water and prepares itself to operate an adiabatic pre-cooling by vaporizing it in the condensers of the chillers, providing a pre-cooling of the heat rejection air. In iso-enthalpic function, increasing the humidity of the air causes a lowering of the dry bulb temperature.

In practice, **the higher the ambient temperature, the higher the production of condensation water and the proportionally higher increase in the efficiency of chillers.**

Reaction times

SYNCHRONIZED COOLING exploits the relatively small size of the single modular chiller units (between 500 and 1000 kW of nominal cooling capacity) and makes the system particularly reactive in responding to sudden calls to bring the project cooling capacity up to speed. This is a necessity of “electrical peak power” plants, designed to compensate for unexpected fluctuations in line loads in the large backbones of electricity distribution due to the advent of more “green” energy producers from natural sources, such as wind or solar. These natural resources introduce energy into the distribution network in ways that are sometimes uncontrolled with sudden loads which then require compensation by the "peak power plants”.

As stated at the beginning of this article, the cooling of the incoming air of gas turbines is not a simple subject. Many factors contribute to populating the designer's table with countless installation solutions. **The advent on the market of Frigel's SYNCHRONIZED COOLING system, an innovative, flexible, intrinsically safe, scalable, and fast installation system could favor the creation of new cooling systems. Its scalability makes it suitable to be evaluated as efficient even for small turbines.** We are working toward an ever-greater diffusion of these systems, which, in fact, by increasing the operational efficiency of energy-intensive plants, can only benefit the environment.