

In comparison

Multifunctional units in the tertiary sector



We talk with two Italian producers

Equipped with additional heat exchangers specially designed for the partial and totally heat recovery condensation, the multifunctional units are able to meet the complex energy requirements of buildings of the tertiary sector

di Mara Portoso

In the buildings used in the tertiary sector, such as shopping centers, hotels, wellness center, large directional complex, there are frequent situations where is required simultaneous production in all seasons of the year of heating and cooling energy for space heating, air conditioning and domestic hot water production. A valid solution to meet the complex energy requirements of the these buildings are multifunctional units, special air-conditioning units equipped with additionally heat exchangers specially designed for the partial and totally heat recovery condensation.

TALK TO THE INDUSTRY



Giovanni Renna
CEO Thermocold

Elena Favero
Line Manager Climaveneta

A solution to resolve

the variability of the thermal loads

Born in order to meet the demand for variable thermal loads of the building during the whole working period - daily, weekly and annual - and especially independently from the seasonal climate, the multifunctional units are essentially heat pumps equipped with two heat exchangers, for the user side, which always maintain their role (evaporator/condenser) during the operation throughout every season of the year and a further "auxiliary" heat exchanger - connected to the source of support: air or water - which occurs when the loads are unbalanced, acting either as a condenser or an evaporator. An important aspect of these units is the self-adapting regulation, that means that is able to determine independently the most suitable operating cycle according to the plant request and

then to the variability of the thermal load request of the building as a function of the exposure and of the various thermohygrometric conditions of the environments.

The proposals of the Italian market

Given the complexity of the technology of these units, are still few today the producers that are able to apply it. We chose to interview two, very different from each other but that stand out both in the Italian market even if their units are completely different for characteristics and size: Climaveneta, European leader in the production of chillers and fifth group in the world for the air conditioning, and Thermocold, company with production in Bari, with a twenty years experience in the sector with a production of their units almost "custom made".

Intelligent working

The coexistence in the same building of space intended to different functions and very variable thermal loads, enhanced by the presence of large windows, make the simultaneous demand of heat and cold throughout the all year, a feature increasingly frequent. One of the strengths of the multifunctional units is the ability to manage in a very flexible way the total power delivered by the unit and its distribution among the various features according to the real load required from the plant.

Climaveneta multifunctional units

Climaveneta therefore presents Integra, multifunctional units for 4 pipes system for the simultaneous production of heating and cooling. These units, exploiting the synergies between hot and cold, provide many advantages compared to traditional multifunctional systems with separate boiler and chiller: "The range of multifunctional units Integra for four-pipe systems is available both with air source and water source, with capacity from 36 to 924 kW", explains Elena Favero, Climaveneta Line managers.

100% cooling and 100% heating

"In operating mode 100% cold side and 100% hot side - Favero continues - the two independent hydronic circuits work both at the maximum power and in the same way, by evaporating in the exchanger cold side and condensing in the exchanger hot side.

"Even an air cooled unit acts like a water-water unit, using all the produced energy for the air conditioning of the building" **Elena Favero**

In this way, also an air-cooled unit behaves as if it is a water-water unit, using all the energy produced for the air conditioning of the building. No energy is disposed on the source exchanger (air coil or water heat exchanger, according to the type of units), confirming that in these conditions all energy is used in the system avoiding any energy waste.

100% cooling and 100% heating

"Even in the operating mode 50% hot side and 50% cold side - specifies Favero - it behaves like a water-water unit, devoting all the energy of evaporation and condensation for the benefit of the system. Since the energy required by system is 50% of the total, each circuit partializes the power delivered from the compressors; in this particular condition the heat exchangers are oversized, allowing to reach even more efficiencies".

The first realization of units suitable for use in 4-pipes systems has American origin and dates from the '70s. As often happens with revolutions technology, the multifunctional units were not immediately understood, and therefore, at least in their first years of life, were they were also little used. In the '80s years was Climaveneta to take the design concept of 4-pipe systems unit following the peculiarities of the then Italian market, optimizing the structure design and the adjustment principles. The first multifunctional Climaveneta unit was installed in 1982 in Milan, in an office building integrated at the factory. Since then the technological evolution of these units had a high growth rate. From the first units with the first R22 piston compressor, Climaveneta moved to more efficient compression component (scroll, screw compressors, to the latest screw-inverter) combined with refrigerants gradually more ecological (R407c, R134a and R410c), giving the lines of development for this type of units.

100% cooling and 50% heating

"In the operating mode 100% cold side and 50% hot side – continue the Climaveneta Line manager - both the two circuits contribute to the production of energy needed for the cooling the environment, evaporating all the refrigerant fluid in the two circuits in the exchanger system "cold side". The condensation instead takes place in a different way: while a circuit makes the condensation on the exchanger system "hot side", thus providing the 50% of the total energy needed for heating the building, the second circuit exchanges the remaining 50% of condensing thermal energy in excess in the external environment by using the disposal exchanger available, air battery or water heat exchanger, according to the type of units ".

100% cooling and 50% heating

"Finally - concludes Favero - even in operating mode 50% cold side and 100% hot side, the two hydronic circuits work independently in order to provide the right amount of energy request the system. While, in fact, the condensation takes place for both circuits in the exchanger "hot", taking advantage in this way of the total energy used the heating of the system, for the cooling section one circuit performs the evaporation on the exchanger "cold" and the second circuit exchanges the remaining energy of evaporation in excess in the external environment by using the disposal exchanger available. Thanks to the advanced logic control of which they are equipped Integra multifunctional units are able to always meet the requirements of air conditioning of the building, even and especially in the case simultaneity of loads. The simultaneous production of cold and hot, is managed independently from the unit based on the real needs.

Integration unit-plant

"The launch of our first multifunctional units dates back to 1994 , explains Giovanni Renna, Thermocold CEO. "In a span nearly twenty years, we have accumulated a vast background of knowledge and experience especially in the field of integration between the unit and the plant, which is one of the most sensitive issues in the use of multifunctional units. For us, in fact, is not sufficient to propose the product, but it necessary to perfectly integrate it into the plant context so to enhance and fully exploit the potential energy and economic benefits ".

MULTIFUNCTIONAL HEAT GENERATOR with scroll compressors, for heating, air conditioning and hot water production up to 60°C. The Energy Prozone model of the Thermocold Heating System has a cooling capacity of 45 ÷ 920 kW, heating capacity of 52 ÷ 1033 kW and a heating recovery capacity of 58 ÷ 1200 kW



" For us multifunctional units not represent a product but a system " **Giovanni Renna**

A vision of system

"Thanks to the careful study of the plant contexts, in collaboration with designers and consultants, we could - Renna continues - not only make more reliable the use of these units, but develop a real system that can fit easily in the building. Having said that for us multifunctional units are not a product but a system, we followed a path aimed at the complete reliability, by choosing, in the view of the complexity of its circuits and of the automated operations, a strong reduction in the number of moving parts and for a more powerful electronic control system. "

Attention to the useful life of the units

"A particularly important aspect, but very often underestimated - points up Renna- is the useful life of the mechanical components in movement and in particular of the compressors. The operating conditions of these units, are in fact, heavier compared to a simple chiller unit or an heat pump, therefore, these organs are subjected to working cycles in which if are used traditional components they would see a rapid functional obsolescence with the requirement for the final user to continuous substitutions and more charge of maintenance costs. Thermocold have been always careful to this issue, explaining that often a higher initial cost, due to the use of the most suitable components for these stressing works, is transformed into a major saving in terms of maintenance costs over the life of the multifunctional system".

Development of plug & play systems

"An other important aspect of these units – concludes the Thermocold CEO- concern the development of a plug & play systems able to recognize and evaluate, without the aid of the operator, any variable of work, to immediately adapt to the changing needs, and to prevent complex situations during the exercise at extreme conditions of work. The operating ranges are, in fact, greatly enlarged, reaching temperature values that were previously unimaginable, suitable for any climatic situation: like temperatures of -40 C°! Finally, the current systems are much more advanced, compared to those of a few decades ago, thanks also to the evolution of a control and management software and hardware".

MULTIFUNCTIONAL COOLING UNIT with axial fans and hermetic scroll compressors for 4-pipes system. The Quattro Prozone model of the Thermocold Multitube System has a cooling capacity of 43 ÷ 969,3 kW and a heating capacity of 52 ÷ 1033 kW

Increase Increases the range, range increase the applications applications

Climaveneta offers a range of air and water multifunctional units, that cover capacity from 36 to 891 kW and guarantees its customers the opportunity to have units totally customizable according to the specific needs of the plant, building or the customer without renounce sustainability and efficiency. The range of heating and cooling capacity offered by Thermocold now extends from 5 to 1000 kW, going to cover a wide range of applications: "Even starting from the same multifunctional system concept - Renna precises – during the years we have diversified the offer in terms of range and assortment; from the products of the Heating System for the residential and commercial where is leading the request the hot sanitary water production and the air conditioning is quite distinct between winter and summer, to the multifunctional units with four and six tubes of the Multitube System for the tertiary sector and in particular, for all the system requirements for typical buildings with high variable loads. The highest advanced technology today is the multifunctional units Duo with double-cycle refrigerator, for the residential and commercial. In its heating operating mode, like a boiler, the Duo is able to provide constant heating performance as the outdoor temperature decreases and with production of hot sanitary water up to 80°C°. Among the last born Hidewall also represent a versatile system specifically dedicated to residential applications, both for the new that for the renovation of old buildings, in line with the latest directives. "

DESIGN APPLICATIONS OF THERMOCOLD MULTIFUNCTIONAL UNITS



INSURANCE AGENCY (NEW ZEALAND). In the realization of a complex directional offices building of an insurance company in Auckland, New Zealand, for the air conditioning has been chosen to install the QUATTRO 2420Z model of the Thermocold Multitube System. Characterized by axial fans and hermetic scroll compressors, the system provides a capacity of 420 kW.



REAL ESTATE AGENCY (PORTUGAL). Within a project of restructuring of the real estate agency in Cascais, Portugal, has been included the renovation of the air conditioning system, the old one has been replaced with the 4 pipes multifunctional units QUATTRO PROZONE 2125Z, of the Thermocold Multitube System, which guarantees a capacity of 125 kW.



HOTEL FOUR VIEWS OASIS (PORTOGALLO). Has been installed the QUATTRO PROZONE 4530ZMAPX model of the Thermocold Multitube System inside the Four Views Oasis Hotel located in Madeira, Portugal. The versatile 4 pipes system is equipped with scroll compressor and

Products covered by patents

All these activities have led to important product enhancements, now covered by several patents: particularly significant are the Cross Exchange System, a patent that allows to reduce by about the 70% the effect of defrost cycle, particularly on the delicate multifunctional systems, and another patent regarding the plant design, that is the starting of the unit at any condition of temperature of the inlet water heat exchanger, even the lowest, during the morning start-up in the cold climates. In addition, we have developed with our R & D dept. specific custom components and above all a powerful electronic platform which is a plus particularly significant.

Provided that and with the large range of patents, we can face with confidence all the critical aspects of installations that require a particularly qualified approach to design and installation. In this regard we have prepared educational tools and training aimed to consultants and designers, installers and maintainers, to inform them comprehensively about the perfect integration of these products in the plants. Finally, in the light of latest regulations about the energy savings and qualification of buildings, has been given a strong impulse in development of products with energy class A and A +. "

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