Zephir Best Practices

CLIVET®

SUMMARY

This document contains some Best Practice, our experience in the developement of overall indoor comfort systems dedicated to specific application.

The updated list of the references is available on www.clivet.com

25 years, Ready for the Future

In 25 years of working on the design, manufacturing and distribution of air conditioning and handling systems, combining high efficiency with minimal environmental impact, Clivet has developed solutions to ensure sustainable comfort and the well-being of people and the environment.
Designing and developing year-round air conditioning solutions with innovative technologies are part of Clivet's DNA, which means the company has always been ready for the future.

25 1989 2014
years of
Clivet

The importance of air renewal

The quality of air inside modern airtight buildings is undermined by a number of pollutants.
The controlled mechanical ventilation system is essential to creating a more liveable environment.
Clivet's stand-alone ZEPHIR system with thermodynamic energy recovery dedicated to ventilation has the following benefits:

- It recovers energy both in winter and in summer
- Reduces the load of outdoor air with a more efficient system and provides more energy for the rooms
- Reduces the capacity of the main generators by limiting their operation to seasonal peaks
- Dehumidifies in summer

PROJECTS

HOBSONVILLE POINT

Auckland – New Zealand
Secondary School
Zephir[2], Zephir[3]
Year 2013-2014

Learn More

SCHOOL

BENNET

Colle Umberto, Treviso - Italy
Hypermarket
Zephir[3]
Year 2014

SHOP

AUDI SHOWROOM

Nola, Naples - Italy
Offices
Zephir[2]
Year 2011

SHOP

CENNI DI CAMBIAMENTO

Milano - Italy
Residential Complex
Hydronic System + Zephir[3]
Year 2013

RESIDENTIAL

UNIVERSIDAD DE MURCIA COMPLEJO ESPINARDO

Murcia - Spain
University
Zephir^3
Year 2013

SCHOOL

DEPORTIVO ANAITASUNA

Pamplona - Spain
Sport Centre
Zephir^2
Year 2011

SPORT

H&M

Brescia - Italy
Store
Zephir^3
Year 2013

Learn More

SHOP

THE SALVATION ARMY

Auckland - New Zealand
Shopping Centre
Zephir^2
Year 2013

SHOP

INNOPOLIS UNIVERSITY

Kazan, Tatarstan - Russian Federation
University
Zephir²
Year 2014

SCHOOL

ZARA

Düsseldorf - Germany
Store
Zephir²
Year 2012

SHOP

IBM

Cerdanyola del Vallés - Spain
Data Centre
Zephir²
Year 2012

DATA CENTRES

PARQUE TECNOLOGICO DE LA SALUD ANTONIO POZO

Armilla - Spain
Hospital
Zephir²
Year 2011

HOSPITAL

FEINAR

Belluno – Italy
Office building
Zephir^3
Year 2014

OFFICE BUILDING

DOMINA CAPANELLE****

Roma - Italy
Hotel
Zephir full fresh air to rooms
Year 2007

HOTEL

PIROGOV HOSPITAL

Sofia - Bulgaria
Hospital for active treatment and emergency
Zephir^2
Year 2012

HOSPITAL

HILTON*****

Barcelona - Spain
Hotel
Zephir full fresh air to rooms
Year 2011

HOTEL

AIGÜES SEGARRA GARRIGUES

Lérida - Spain
Office Building
Zephir²
Year 2011

OFFICE BUILDING

POLIDEPORTIVO VILLATUERTA

Villatuerta - Spain
Sport Centre
Zephir²
Year 2011

SPORT

QUASAR VILLAGE

Perugia - Italy
Shopping Centre
WLHP System + Zephir³ + Packaged
Year 2014

SHOP

CONE'

Conegliano Veneto, Treviso - Italy
Shopping Centre
WLHP System + Zephir
Year 2010

Learn More

SHOP

TRANSPORTES METROPOLITANOS DE BARCELONA

Barcelona - Spain
Station
Zephir^3
Year 2011 and 2013

TRANSPORTS

AGENCIA ESTATAL DE ADMINISTRACION TRIBUTARIA

Girona - Spain
Office Building
Zephir^2
Year 2011

OFFICE BULDING

HOTEL SIETE ISLAS****

Madrid - Spain
Hotel
Zephir^2
Year 2012

HOTEL

ESCALA YACHT CLUB

L'Escala, Girona - Spain
Multi-functional building
Restaurants, multi-functional room and offices
Hydronic System + Zephir
Year 2010

Learn More

MULTI-FUNCTIONAL BUILDING

PRAKTIS

Haskovo - Bulgaria

Supermarket

Zephir²

Year 2011

SHOP

CENTRO MERIDIANA LECCO

Lecco - Italy

Multipurpose Complex

Executive, Residential, Commercial

Zephir²

Year 2006

Learn More

MULTI-FUNCTIONAL BUILDING

NOVOTEL****

Sofia - Bulgaria

Hotel and offices

Zephir² and Zephir³

Year 2012-2013-2014

HOTEL

LIEBHERR INTERNATIONAL AG

Sofia - Bulgaria

Industry

Zephir²

Year 2011

INDUSTRY

EDIFICIO MONEDA BICENTENARIO

Santiago de Chile - Chile
Offices
Zephir² + VRV
Year 2013

OFFICE BUILDING

WOOLMORE PRIMARY SCHOOL

London - UK
School
Zephir³
Year 2014

SCHOOL

ECOLE A BETH ISRAEL

Epinay sur Seine, Paris - France
School
Zephir³
Year 2013

SCHOOL

MOVIE PLANET

San Martino Siccomario, Pavia - Italy
Multiplex cinema
Zephir²
Year 2011

CINEMAS

BINGO

Alghero, Sassari - Italy
Entertainment
Zephir²
Year 2011

ENTERTAINMENT

ATHENA SHOPPING GALLERY

Messina - Italy
Shopping Gallery
Zephir²
Year 2012

SHOP

TERMINAL 2 MILAN MALPENSA AIRPORT

Varese - Italy
Airport
Zephir³
Year 2014

TRANSPORTS

SAN PIER DAMIANO HOSPITAL

Faenza, Ravenna - Italy
Specialised hospital
Hydronic System + Zephir²
Year 2010

Learn More

HOSPITAL

LE TERRAZZE

La Spezia - Italy
Shopping Centre
Zephir^2
Year 2012

SHOP

MIRAMARE BINGO

Genova - Italy
Entertainment
Zephir^2
Year 2011

ENTERTAINMENT

THE MALL GUCCI

Firenze - Italy
Outlet
Zephir^3
Year 2013

SHOP

BAGNO REGGIO EMILIA PRIMARY SCHOOL

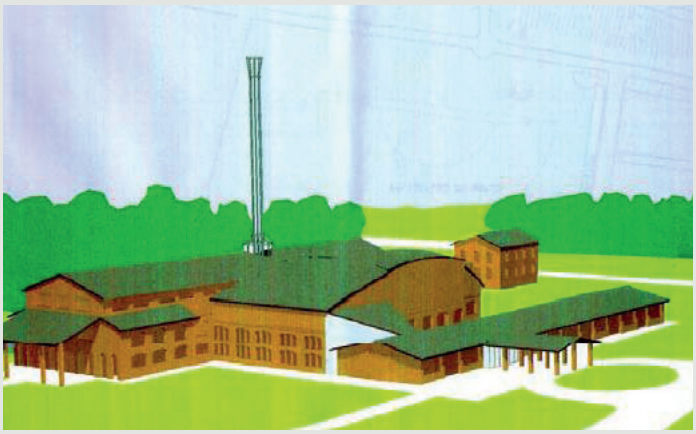
Bagno, Reggio Emilia - Italy
School
Zephir^2
Year 2012

SCHOOL

ISTANBUL GONEN*****

Istanbul - Turkey
Hotel
Zephir² + VRF
Year 2012

HOTEL



EX FORNACE SCHOOL DISTRICT

Riccione, Rimini - Italy
Hotel
Zephir³
Year 2013

SCHOOL

BENNET

Casatenovo, Lecco - Italy
Hypermarket
Zephir²
Year 2012

SHOP

CASELLE CENTER

Caselle Torinese, Torino - Italy
Shopping centre
WLHP System + Zephir
Year 2005

Learn More

SHOP

SAN MARTINO HOSPITAL

Messina - Italy
Hospital
Zephir²
Year 2012

HOSPITAL

SPORTS HALL

Buftea - Romania
Sport
Zephir²
Year 2011

SPORT

PANORAMA

Parma - Italy
Commercial Centre
Zephir²
Year 2013

SHOP

SANT'AGATA DEI GOTI PRIMARY SCHOOL

Sant'Agata dei Goti, Benevento - Italy
Primary School
Zephir²
Year 2014

SCHOOL

SCHOOL GYM

Soliera, Modena - Italy
School Gym
Zephir^3
Year 2014

SPORTS

DIA.METRA

Spello, Perugia - Italy
Chemical Industry
Zephir^3
Year 2014

INDUSTRY

TERLIZZI SURGERY

Terlizzi, Bari - Italy
Hospital
Zephir^3
Year 2013

HOSPITAL

ARCHAEOLOGICAL MUSEUM

Pietrabbondante, Isernia - Italy
Museum
Zephir^2
Year 2012

MUSEUM

NOGARA HOSPITAL

Nogara, Verona - Italy
Hospital
Zephir²
Year 2012

HOSPITAL

PALERMO UNIVERSITY

Palermo - Italy
University
Zephir³
Year 2014

SCHOOL

VERONA EXHIBITION CENTRE

Verona - Italy
Exhibition Centre
Zephir²
Year 2011

EXHIBITION CENTRE

PHARMACEUTICAL WAREHOUSE

Reggio Emilia - Italy
Pharmaceutical Industry
Zephir²
Year 2011

INDUSTRY

LA RANCIA SHOPPING CENTRE

Tolentino, Macerata - Italy
Shopping Centre
Zephir^3
Year 2014

SHOP

VILLAMARINA SCHOOL DISTRICT

Villamarina, Forlì-Cesena - Italy
School District
Zephir^3
Year 2014

SCHOOL

LAMBORGHINI

Bologna - Italy
Offices/Industry
Zephir^2
Year 2013

INDUSTRY

FUTURAMA SPORTS CENTRE

Volla, Naples - Italy
Sports Centre
Zephir^3
Year 2011

SPORT

CITTA' DEL RUGBY

Parma - Italy
Sport Centre
Zephir²
Year 2013

SPORT

FOOD VILLAGE AT UCI

Casoria, Napoli - Italy
Restaurant
Zephir²
Year 2011

RESTAURANT

MONOPOLI INFANT SCHOOL

Monopoli, Bari - Italy
Infant Shool
Zephir³
Year 2014

SCHOOL

SKOPJE ALEXANDER THE GREAT AIRPORT

Skopje - Republic of Macedonia
Airport
Zephir²
Year 2011

TRANSPORTS

MAXIMILIAN'S

Chelyabinsk - Russian Federation
Restaurant
Zephir
Year 2013

RESTAURANTS

ODITH CAFE

Ufa - Russian Federation
Restaurant Café
Zephir^3
Year 2014

RESTAURANT

INNOPOLIS STAGE TECHNOPARK

Kazan, Tatarstan - Russian Federation
Business and Research Centre
Zephir^3
Year 2014

INDUSTRY

MAXIMILIAN'S

Novosibirsk - Russian Federation
Restaurant
Zephir^3
Year 2014

RESTAURANT

SPA HOTEL

Lanzarote. Spain
Hotel, Spa
Zephir²
Year 2013

HOTEL

RANGIORA TOWN HALL

Rangiora - New Zeland
Office Building
Zephir³
Year 2014

OFFICE BUILDING

AYURPARK HEALTHCARE

Bangalore - India
Industry
Zephir³
Year 2014

INDUSTRY

CRUISE TERMINAL

Santa Apolónia, Lisbona - Portugal
Cruise Terminal
Zephir²
Year 2011

TRANSPORT

QUARTZO MUSEUM

Santa Apolónia, Lisbona - Portugal
Cruise Terminal
Zephir²
Year 2011

MUSEUM

SANT'ANA HOSPITAL

Lisbona - Portugal
Universitary Hospital
Zephir²
Year 2012

HOSPITAL

HOTEL PLAZA****

Lisbona - Portugal
Hotel
Zephir²
Year 2011

HOTEL

AK PLAZA

Istanbul - Turkey
Business Centre
Zephir³
Year 2014

OFFICE BUILDING

BEST PRACTICES

HOBSONVILLE POINT

Auckland – New Zeland
Secondary School
Zephir^3
Year 2014

Located in the Western area of Auckland city, Hobsonville Point is a brand new city born where the Royal New Zealand Air Force's seaplanes were based. Designed according to the most innovative and environmental-friendly technologies, it features first-class building services.

Hobsonville Point Secondary School is sized for 1,350 students aged 13 through 18, with a dynamic program and partnership, in a modular architectural concept.

As many as 28 ZEPHIR^3 packaged Primary Air supply systems manage year-round over 200,000 m^3/h of outdoor air, providing air purification and tight control on temperature and humidity. This is performed by their inbuilt reverse cycle heat pump circuit, complete with inverter-driven compressors, EC fans with variable flow capability, Freecooling control and high efficiency thermodynamic energy recovery.

It results in impressive design simplification - having no pipework and further heating or cooling systems for outdoor air management - high energy efficiency and great saving in the total life cycle cost.

This site follows the Hobsonville Point Primary School, opened in 2013 and featuring 13 ZEPHIR packages as well.

H&M

Brescia – Italy
Shop
Zephir^3
Year 2013

The Swedish chain of clothing stores H&M in the center of Brescia is born from the refurbishment of the building that was previously the Banca di Novara.
The H&M shop in Corso Palestro is a three floor full concept store with a surface of 2000 m^2 that sells women's, men's, children's, maternity and large size fashion cloths as well as accessories, underwear and make-up.

The air quality and the comfort of customers and operators is granted by three air renewal and purification Clivet units ZEPHIR^3, equipped with electronic filtration and active thermodynamic recovery of the energy contained in the exhaust air, reducing primary energy consumption and CO_2 emissions in line with the Swedish group environmental policy.

Clivet units have also been chosen for their compactness, which has helped to reduce the overall dimensions by 50% compared to a traditional air handling unit and for their quietness, essential in a historic center.

CENTRO MERIDIANA

Lecco - Italy

Multipurpose Complex

Executive, Residential, Commercial

4P Hydronic System

Year 2006

Designed by the famous architect Renzo Piano, the "Centro Meridiana" complex covers more than fifty thousand square metres in the heart of Lecco. This multipurpose complex hosts a large park and a circular town square surrounded by three ten -storey buildings given over to residences, offices, housing, tourist and service facilities. The lower level hosts a shopping centre and two thousand parking spaces.

The Challenge

"Centro Meridiana" is a high quality property initiative which arose from the redevelopment of a strategic urban area near Lake Como, a refined centre of tourism.

Designed by world famous architects, the complex is aimed at consumers who are attentive to overall comfort and the technological solutions adopted.

The air-conditioned areas, intended for differing uses, are all united by high standards of comfort and air quality.

Due to the large glassed surface area which has different levels of solar exposure, concurrent thermal requirements are often in opposition.

The architectural complex prevented the use of external space for the plant, while the fire-prevention regulations also limited using a centralised heating plant, which would necessarily have had a large capacity.

Furthermore, the commissioning customer was also very sensitive to environmental aspects and requested zero pollution technology in order to heat and cool the building without polluting the air and minimising the carbon dioxide, CO_2, emissions into the atmosphere.

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Centro Meridiana - Dettaglio delle sculture di Susumu Shingu e interno appartamento

The building

- Three 10-storey towers, for a glassed surface area of over 8,000 m^2

The size

- Total volume of more than 260,000 m^3
- Executive and residential surface area of 29,000 m^2

The team

- Architectural design Renzo Piano, Italy
- General Contractor Colombo Costruzioni, Italy
- Mechanical systems design Studio Tecnico Guffanti, Italy
- Mechanical systems production Gianni Benvenuto, Italy

About Renzo Piano

Born in Italy in 1937, Renzo Piano is today a world famous architect. His ambitious and innovative projects are renowned and include the Georges Pompidou Centre in Paris, the international Osaka airport, the Hermès Tower in Tokyo and the Vulcano Buono multipurpose centre in Nola. Numerous articles have been published on his work and exhibitions have been dedicated to him all over the world. He has been a UNESCO ambassador for architecture since 1994.

The solution

The system designed by Studio Tecnico Guffanti is as important as the architectural design.

The air-conditioning in the various settings of the three towers occurs through radiating ceilings combined with air refreshment and humidity control systems. The ceiling hydronic circuits are powered by the Clivet 4P-W geothermal system for an automatic and concurrent production of hot fluid, cold fluid and hot water for sanitary use.

The 4P system is based on energy saving water-to-water pumps, whose commutation takes place via the hydraulic circuit and not by acting on the cooling circuit overall, therefore taking advantage of the global reliability of the plant. The underlying natural ground water energy sources are used in full respect of the regulations laid down by the local Authorities

Developed in order to optimise the energy performance of the apparatus, the Clivet system activates the production of cooled or heated water in the circuits used based on necessity. It establishes if the secondary fluid (hot in summer, cold in winter) should be recuperated in other parts of the system. For example, areas are heated which are not exposed to the sun or hot water is pre-heated for sanitary use. Only if an effective energy excess takes place will the automatic valve system activate an exchange with the water tank.

The pressure monitoring system acts by an inverter on the tank pump, and reduces its flow to a minimum to limit electricity and water consumption. After exchanging with the Clivet system, the water is put back into the natural ground water energy sources, in order to maintain their equilibrium.

Moreover, the towers are equipped with an air-refreshment system which guarantees fresh air intake and environmental humidity control at the same time. In the areas where the offices are located, this system is centralised, with a Zephir fresh air air-to-air heat pump equipped with active thermodynamic integrated energy recovery and high-efficiency H10 electronic filters.

The Results

Zero emission towers with a geothermic heart is the environmental approach offered by the Centro Meridiana. Thanks to this solution, it is possible to guarantee comfort in all settings while eliminating around 1,100 tonnes of CO_2 annually.

Completely hidden from view, the 4P-W energy recovery system produces hot water, cooled water and hot water for sanitary use efficiently by minimizing the use of ground water energy. The active recovery of the Zephir air-refreshment heat pumps further increases the efficiency of the entire system and reduces its utilised capacity.

Moreover, the Gianni Benvenuto installation company won the First readers' prize in the *Impianti Premiati (Award-winning systems) 2008* competition promoted by the main Italian magazines in the sector under the patronage of Aicarr.

For further information about Clivet systems:
www.clivet.com


Centro Meridiana – 4P system heat pump and fuel headers

The System

- The Clivet 4P-W System is made up of four geothermal SPINChiller WSH-SC units and its related automatic management by a user interface *touch screen*
- A geothermal WSH-SC unit for the production of high-temperature hot water for sanitary use
- Six Clivet Zephir air refreshment units, complete with integrated active thermodynamic heat recovery and electronic filters
- More than fifty Clivet hydronic outlets
- More than 2 MW of overall cooling capacity

About Geothermics

High-enthalpy geothermics taps into geological or volcanological anomalies for the production of electrical energy and the use of thermal water for heating. Low-enthalpy geothermics, on the other hand, use natural ground water energy sources as a thermal fuel tank to extract energy during the winter, which is transferred back during the summer. It is used for air-conditioning using underground sensors or natural ground water energy sources such as a well, stratum, river, canal, lake or seawater.

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CASELLE CENTER

Caselle Torinese, Torino - Italy

Shopping centre

1 Bennet hypermarket and 30 shopping units

WLHP system

Year 2005

"Caselle Center" shopping centre is located in northern Italy, near Turin. It includes the Bennet hypermarket, the Bennet Universe consumer electronics superstore and a mall with many specialised shops.

The challenge

The Bennet group usually develops and manages its own hypermarkets and shopping centres. Therefore it is very focused on both initial and operation costs. Furthermore, it often analyses and publishes operational energy saving details when innovative solutions are adopted.

While designing the new Caselle Torinese shopping centre, Bennet technical department decided to exploit all possible options of integrating energy sources, to maximize the efficiency and decrease operating costs.

To confirm the actual performance, the plant of the new shopping centre would be equipped with energy meters and with a plant management system connected to the Bennet headquarter.

Over a 12 month period the energy consumption would be compared with a centre having the same general and operational features, but equipped with a traditional system.

Caselle Center - Main entrance and general layout

Building type
- Single-level prefabricated building

Building size
- Commercial area GLA 12,200 m^2
- 1 hypermarket and 30 shopping units

Building team
- Developer Gallerie Commerciali Bennet, Italy
- Mechanical plant design Cotefa, Horus, Italy
- Works supervision Bennet Technical Dept., Italy
- Mechanical contractor Gianni Benvenuto, Italy

About Bennet

The Bennet group has operated in Italy since 1964. It owns about 60 hypermarkets and 36 malls with over 1,000 shopping units. Bennet is distinguished by a special care for innovation of its outlets and the quality offered.
For all its achievements, it pays great attention to technology and to the optimisation of the overall investment costs (design, implementation/realisation, operation and maintenance).

The solution

To achieve the goal of both integration and energy efficiency, Bennet chose the Water Loop Heat Pump air conditioning plant, based on the WLHP system from Clivet.

Each unit is served by one or more water-to-air heat pumps. Each of them has individual operation and is able to heat, cool or ventilate the premises according to the specific needs.

The heat pumps are all connected to the loop circuit. It remains at neutral temperature as to the rooms served and therefore does not require insulation, except for short outdoor paths.

The loop circuit allows the energy transfer between areas with opposite thermal requirement. This often occur in winter, when the mall has to be heated while most shops require internal cooling.

Larger environments, such as hypermarket, anchors and mall, are served by rooftop packaged heat pumps. Thanks to the automatic freecooling feature, in mild weather the premises can be cooled without the activation of the compressors.

Lower capacity heat pumps are either ceiling mounted type on shopping units, located in the warehouse, or console type in the offices. Fresh air is supplied by specialised air-to-air high-efficiency heat pumps, equipped with an innovative thermodynamic energy recovery, electronic controlled fans and double stage air filtration.

In this project the loop system also recovers the energy disposed from the food refrigeration equipment. In fact, the water of the loop operates the first stage of condensation of refrigerated displays and cold rooms.

In this way the efficiency of the refrigeration system increases. At the same time, winter heating demand from the air-conditioning system decreases.

The results

Bennet carefully recorded and processed the 2007 operation costs for Caselle Center. They were compared with another shopping centre of similar area, construction and climate. The results were presented in 2008 during a retail technical conference in Milan.

Caselle Center consumed half natural gas compared to the "twin" shopping centre (-49.5%).

The electricity consumption for air-conditioning and food refrigeration was considerably reduced to more than a fifth (-22.2%).

Although there was an increase in initial cost due to the system employing energy recovery from the commercial refrigeration and due to the differences in electrical distribution, a payback of only 3 years was achieved.

Thanks to the WLHP system adopted, over a fifteen year period the savings in operating costs will be over a million euros.

For further information about Clivet systems
www.clivet.com

Caselle Center – Recovery from food refrigeration and water-to-air Rooftop for malls

The system

- Ten Clivet water-to-air heat pumps, CRH rooftop type for mall, hypermarket, restaurant.
- Over thirty Clivet water-to-air heat pumps for shopping units and offices, either ducted CH or console EQV
- Three Zephir fresh air units from Clivet, complete with integral thermodynamic energy recovery
- Clivet plant management system, including workstation and user interface pages with custom graphics.
- The system is completed by two evaporative coolers, two boilers and pumping stations.

About WLHP

The Water Loop Heat Pump air conditioning system is de-centralized and based on heat pumps whose energy source is the water in the loop circuit. Its temperature is stabilized in summer from rejection devices such as evaporative towers or dry coolers, while in wintertime boilers or heat pumps can support. The system perfectly suits to integration with renewable energy sources.

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ESCALA YACHT CLUB

L'Escala, Girona - Spain

Multi-functional building

Restaurants, multi-functional room and offices Hydronic System

Year 2010

Located in the middle of the complex, the Escala Yacht Club multi-functional building includes many services both for its members and for its guests. This is the location where all types of meetings and events in the nautical and marine sector take place .

The challenge

The different activities inside the building are differentiated, according to the thermal need and mainly for the time and working conditions.

Beside the daytime activity of the offices, the pubs and restaurants are open all day long plus the multi-functional area are occasionally used.

This is why the cooling system should be flexible and quick response times should be offered to different requests coming from every area.

Furthermore, the Customer stated his ecological engagement to choose a solution with a low environmental impact obtained mainly by eliminating the wastes and by reducing energy costs necessary to keep the comfort.

Clearly the whole installation cost would be an other important factor to take the final decision.

Escala Yacht Club – Aerial view and one sight of the Restaurant
www.nauticescala.com - www.blueflag.org

The building

- Two levels building

Dimensions

- Restaurant, pub, multi-functional room, offices
- Total surface 1.300 m^2

The team

- Contractor Imir
- Supplier of the HVAC systems Comercial Eléctrica Grup

About the Escala Yacht Club

Escala Yacht Club is placed in an enviable position in the middle of Costa Brava, the perfect place for tourists, to practise sailing and sportive fishing. It is a private structure extremely developed, including 957 moorings with the relevant services and it is the seat of a prestigious Sailing School. Escala Yacht Club works with a careful ecological policy and this is the reason why it has gained the Blue Flag. This important environmental prize distinguishes the most virtuous beaches and marines of 44 Countries all over the world .

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The solution

To grant the highest functional autonomy, two installations have been supplied, both hydronic type with air to water reversible heat pumps, two pipes terminals and fresh air units with active thermodynamic heat recovery.

The heat pump for the pub and restaurant installation includes Scroll R410A compressor, Ice Protection System device to protect the external exchanger during winter and water circulator integrated with variable speed, a standard solution also for the external fan.

The cassette type terminals include a centrifugal type condensate discharge pump and the integrated distribution of the air through the four ways with adjustable wings.

The same solution for the multi-functional room, where the terminals are of vertical type, placed at the end of the room to directly supply the air.

The air renewal on both installations is made by direct expansion monobloc units with active thermodynamic recovery, with direct supply with variable flow diffusers.

They are equipped with the Extrapower additional exchanger fed with chilled or hot water, both to increase the dehumidification capacity during summer operation, being very close to the sea, and also in winter in case of the requirement of thermal integration.

The results

Each one of the two functional areas is completely independent from the other one both for comfort needs and operating times.

Thanks to their compactness, all external units have been placed on the roof, becoming therefore invisible for passers-by and users.

The air renewal units with active thermodynamic recovery, equipped of their own high efficiency cooling circuit, have reduced the necessary capacity on the hydronic heat pumps and therefore have allowed the purchase of models of a lower size.

Consequently also the distribution hydraulic circuit has been reduced, with an economic advantage in making the installation and energy saving to run it.

The design estimation has highlighted total primary energy consumption 30% lower than a conventional solution.

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If you need further information on Clivet systems
www.clivet.com

Escala Yacht Club – Heat pumps start up on the roof and cassette type terminals

The System

- 6 air-water heat pumps Clivet ELFOEnergy Compact
- 3 air renewal units Zephir^2 and ELFOFresh Large by Clivet,, including the active thermodynamic recovery
- 2 hydronic terminal vertical units Clivet ELFODuct CF-V
- 10 hydronic terminal unit Clivet ELFOSpace Box2

Concerning air renewal with active thermodynamic recovery

Zephir2 by Clivet uses the exhaust air as thermal source for its reversible direct expansion circuit. It uses the thermal or cooling power produced with high efficiency, to eliminate the fresh air load and to supply further thermal or cooling power to the served area, according to the request and proper conditions. The whole efficiency is higher if compared to passive heat recovery, both cross flow and heat wheel, thanks also to the fact that the internal pressure drop is reduced. Besides, supplying more energy in the served areas, Zephir2 allows an important reduction for the ventilation costs for all the life cycle of the installation.

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SAN PIER DAMIANO HOSPITAL

Faenza, Ravenna - Italy

Specialised hospital

148 beds

ZEPHIR System and Hydronic System

Year 2010

Specialised in Orthopaedics, Traumatology, Surgery and Ophthalmology, the San Pier Damiano Hospital is one of the over 20 hospitals of GVM Care & Research. It offers high standards of care and cutting-edge technologies for in-patients, along with day hospital and day surgery patients.

The challenge

GVM ICare & Research's Code of Ethics commits all its operators to promote the well-being of each individual patient. Therefore, comfort and the quality of air played a decisive role in the full refurbishment of the systems used within the wards, a necessary investment for a first-class facility established almost 50 years ago.

As this was an existing building, the new climate control and air renewal systems needed to be discreet.

More importantly, the works needed to be carried out without suspending healthcare activities and related services or cause inconvenience to patients.

This is why the Client and the Professionals decided to carry out the works gradually on a floor by floor basis.

However, choosing the system to install also depended on other imperative needs, starting from the strict hygiene standards applying in hospital facilities.

The ability to ensure continuity in operation was another important critical decision factor.

Finally, financial aspects were carefully taken into account, both in terms of the initial economic investment and, above all, running costs, which were crucial in the balance sheet of a facility operating 24/7.

San Pier Damiano Hospital – Dialysis and intensive care unit.
www.gvmnet.it

The Building

- Concrete building with 7 floors

The facilities

- 148 beds
- 12 dialysis units and 4 intensive care units

The team

- Promoter GVM Real Estate (Italy)
- System design P.D.M. Progetti, Italy
- Project managed by GVM Real Estate, Italy

About GVM Care & Research

GVM Care & Research was founded in 1973 with the specific purpose of operating in highly specialised domains, namely Cardiology and Heart Surgery. Today its Healthcare Facilities comprise 22 Hospitals and 4 Clinics in Italy and 3 Hospitals in Poland, France and Albania. Investments are focused on avant-garde technologies: 160 of its 1700 beds are designed for intensive and critical care. It also has 5 linear accelerators for Radiotherapy, 21 Haemodynamics labs, 13 MRI machines and 16 CT machines. GVM Care & Research is one of the very few Italian operators with the Gamma Knife, which uses gamma radiation for the non-invasive treatment of brain conditions (www.gvmnet.it).

The solution

A hydronic system was chosen for the year-round climate control needs of the wards.

The terminal elements consist of active induction chilled beams suitable for this specific application, as they do not have air filters and devices to collect condensation.

The primary air supplied to the chilled beams comes from two Clivet ZEPHIR^2 systems with fixed-point supply control set at 20° C in winter and 21°C with a specific humidity of 11 g/kg in summer. The active thermodynamic recovery unit with reversible heat pump operates all year round on the load of renewal air and in cooling mode it also reduces internal latent loads with three capacity control steps.

Both systems are fitted with the hydronic Extrapower exchanger connected to the existing hot or chilled water mains. It accurately controls the supply temperature in heating mode and can further increase dehumidification in particularly demanding conditions in summer.

In cooling mode the supply temperature is accurately controlled by the modulating post-heating function with hot gas recovery.

Renewal air is treated by the in-built high efficiency electronic filters that capture nanoparticles, PM10, bacteria and pollen.

The air supply and return ducts of the two systems have special manually-operated bypass dampers to ensure the supply of primary air to all the chilled beams, even if one of the two systems stops operating.

The results

The solutions adopted, namely the high dehumidifying capacity and electronic filtering, have noticeably increased the quality of air in the wards, as noticed by users and operators.

The system proved to be able to work non-stop also in very severe weather conditions with outdoor temperatures between -15°C e +40°C.

The gradual execution of the works in one area at a time avoided disruption to healthcare services. The second primary air system was purchased and installed a year after the first one, which also spread the investment. The air flow rates were set in relation to specific needs on a case-by-case basis, until the current final set-up was identified.

The choice of stand-alone primary air systems allowed the client to keep existing cooling and heating fluids and reduce their use to a minimum. Therefore, it was not necessary to invest in a new heating and cooling unit.

Works on the roof were minimal too, thanks to the system's very compact design and the presence of just two pipes for the fluids.

The high energy efficiency and positive experience led GVM Care & Research to also choose Clivet to increase the efficiency of the chilling system, where one of the existing chilling units was replaced with a SPINchiller2 with modular Scroll technology with a capacity of over 500 kW.

For further information about Clivet's systems
www.clivet.com

San Pier Damiano Hospital – Detail of an active chilled beam and two ZEPHIR^2 primary air systems on the building's roof

The system

- 2 Clivet ZEPHIR^2 primary air systems with thermodynamic energy recovery and an overall air flow rate of 18,000 m3/h, along with fixed-point supply control in the wards
- More than 70 active chilled beams with two pipes and a two-way regulating valve for variable water flow rate systems
- The system is completed by two air-condensed liquid chillers, three high efficiency boilers and a centralised supervision system

About ZEPHIR

The ZEPHIR system includes the whole primary air plant in a single standalone unit. It features the reverse cycle heat pump active thermodynamic heat recovery, high efficiency electronic filters, electronic controlled fans, reheat by hot gas recovery. Its capacity replaces most of the heating and cooling central equipment, without the use of fossil fuels. It adapts the systems to industrial standards as it eliminates most of the work on site. It is ideal when coupled to fancoil units, VRF direct expansion systems, radiant systems and chilled beams, and to increase the efficiency of existing air handlers.

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CONÈ

Conegliano Veneto, Treviso - Italy

Shopping centre

Hypermarket and 59 stores

WLHP and ZEPHIR systems

Year 2010

The Conè shopping centre, promoted and managed by IGD, represents an important investment inside an economically vibrant and dynamic area. It includes an Ipercoop hypermarket and a shopping mall with strongly attractive national and international brands.

The Challenge

According to its real estate vocation, IGD wanted to build and manage on the long run a shopping pole able to attract and retain both profitable operators and customers.

Operators would have had available efficient services and excellent marketing but, above all, high-quality stores, independent and easy to operate.

The energy efficiency of the whole installation was a key factor to reduce the operating costs.
Therefore it represented the main challenge IGD put on the Designer, who was assigned to research and develop the solution with the best pay-back .

Consumers would have been offered interesting cultural initiatives and entertainment program, in a comfortable environment all year round, independently on the outdoor conditions and on the type of shop visited.

Conè – View from the mall and store directory
www.centrocommercialecone.com

The building

- Two-level prefabricated building

Sizes

- Gross leasable area (GLA) 21.400m^2
- 1 hypermarket and 59 stores
- Over 1.500 parking lots

The team

- Promoter IGD, Italy
- System design Climosfera, Italy
- Contractor Toninato Impianti and Idrotermica COOP, Italy

About IGD

Immobiliare Grande Distribuzione (IGD) is one of the most important European names in the real estate business. Born from Coop Adriatica and Coop Tirreno asset merger, IGD acquires and manages real estate properties like hypermarkets and malls on a long-term strategy. It was the first Italian company to gain the status of Listed Real Estate Investment company (SIIQ). Nowadays it operates in Italy and in Romania under Winmarkt brand. Its Real Estate value is next to 2 billions Euro.

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The solution

A reverse cycle heat pump design was chosen for the whole centre. It is based on the Clivet WLHP solution, with thermodynamic recovery systems on the exhaust air. The water loop is made by two PVC variable flow circuits, to serve the shopping mall and the hypermarket. The total water volume is 50.000 litres.

The mall is served by water-to-air rooftop reversible heat pumps, complete of outdoor air management, Freecooling and integrated thermodynamic recovery on the exhaust air.

The fresh air to the stores is centralized and is supplied by two Clivet air-to-air systems with thermodynamic heat recovery. Furthermore every store is equipped with one or more water-to-water ducted heat pumps, under each tenant's responsibility.

Dedicated outdoor air systems with thermodynamic recovery serve also the offices, conditioned by a reversible water-to-water heat pump and 2-pipes hydronic ceiling cassettes, and the toilets.

The hypermarket is conditioned by reversible water-to-air rooftop heat pumps as well. Unlike other units, the rooftop serving the fresh produce section is not equipped with heat recovery: this function is provided by a further thermodynamic recovery system that supplies tempered outdoor air by recovering thermal energy from the exhaust air in the fish processing department.

Other complementary premises, like the pharmacy corner and the perishable warehouse, are served by dedicated ducted water-to-air heat pumps.

Other processing departments are also served by thermodynamic recovery systems, associated to a central water-to-water reversible heat pump that uses the loop as a source and feeds hydronic terminal units. Only the meat processing department includes an evaporator connected to the commercial refrigeration system, to keep the very low temperature required by law.

The commercial refrigeration system is a free source of heat, from 150 to 230 kW, thanks to the condensation heat recovery made by the water loop system. In the cold season, the system recovers energy during the night just circulating the water to raise its temperature when heat pumps are off.

Hot water for sanitary use and to heat the warehouses is provided by a water-to-water heat pump. In the summer season, pre-heat is done by thermal solar panels. The hypermarket offices are conditioned as the ones of the mall.

The system design takes great care of the whole environmental impact. It also includes a well, to provide evaporative coolers with makeup water and for irrigation, and photovoltaic panels with 160 kW of peak power output .

The results

The start-up time of the centre was met. Its operation is considered efficient, versatile and reliable. The correct flushing of the water loop circuits helped to hit this target.

The WLHP system has been confirmed able to both transfer thermal energy inside areas with opposite loads and spread out capital cost among the single *tenants*.

The Clivet dedicated outdoor air system with thermodynamic recovery reduced the water loop system capacity, because their thermal source is the exhaust air. As a direct benefit, both heat injection and rejection equipment and the pumping stations were downsized. This also results in increasing the weight of the heat recovery from commercial refrigeration: boiler operation is minimal, thus the gas consumption is considerably reduced, as already experienced in other projects.

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If you need further information on Clivet systems
www.clivet.com

Conè – ZEPHIR dedicated outdoor air system with thermodynamic heat recovery and water-towater heat pumps in the technical room

The System

- 8 water-to-air reversible heat pumps CLIVETPack CRH-XHE,
- rooftop type for mid-attendance applications
- 10 Clivet ZEPHIR² and ELFOFresh Large dedicated outdoor air
- systems, with integral active thermodynamic heat recovery
- Over 40 water-to-air ducted CH reversible heat pumps
- 3 water-to-water heat pumps Clivet SPINchiller WSH-SC, WRHN,
- WSHN-EE, 2 pumping stations model GP2 with 500 l. storage
- tank, 48 hydronic terminals Clivet CF and ELFOSPACE BOX2
- The system is completed by four evaporative coolers for total 4,6
- MW, three condensation boilers and a supervision system.

About ZEPHIR

The ZEPHIR system includes the whole primary air plant in a single standalone unit. It features the reverse cycle heat pump active thermodynamic heat recovery, high efficiency electronic filters, electronic controlled fans, reheat by hot gas recovery. Its capacity replaces most of the heating and cooling central equipment, without the use of fossil fuels. It adapts the systems to industrial standards as it eliminates most of the work on site. It is ideal when coupled to fancoil units, VRF direct expansion systems, radiant systems and chilled beams, and to increase the efficiency of existing air handlers.

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PROJECT LISTINGS

SCHOOL
Hobsonville Point Secondary Schhol - Auckland, New Zealand
Complejo Espinardo University of Murcia, Murcia - Spain
Innopolis University, Kazan, Tatarstan - Russian Federation
Woolmore Primary School, London - UK
Ecole à Beth Israel, Epinay sur Seine, Paris - France
Primary School, Bagno Reggio Emilia - Italy
Ex Fornace School District, Riccione, Rimini - Italy
Primary School, Sant'Agata dei Goti, Benevento - Italy
Palermo University, Palermo - Italy
Villamarina School District, Villamarina, Forlì-Cesena - Italy
Infant Shool, Monopoli, Bari - Italy

SHOP
Bennet Hypermarket - Colle Umberto, Treviso - Italy
Audi Sowroom - Nola, Naples - Italy
H&M Store, Brescia - Italy
The Salvation Army Shopping Centre, Auckland - New Zealand
Zara Store, Düsseldorf - Germany
Quasar Village Shopping Centre, Perugia - Italy
Coné Shopping Centre, Conegliano Veneto, Treviso - Italy
Praktis Supermarket, Haskovo - Bulgaria
Athena Shopping Gallery, Messina - Italy
Le Terrazze Shopping Centre, La Spezia - Italy
The Mall Gucci, Firenze - Italy
Bennet Hypermarket, Casatenovo, Lecco - Italy
Caselle Center, Caselle Torinese, Torino - Italy
Panorama Commercial Centre, Parma - Italy
La Rancia, Shopping Centre, Tolentino, Macerata - Italy

OFFICE BUILDING
FEINAR, Belluno – Italy
Aigues Segarra Garrigues, Lérida - Spain
Agencia Estatal de Administración Tributaria, Girona - Spain
Edificio Moneda Bicentenario, Santiago de Chile - Chile
Rangiora Town Hall, Rngiora - New Zeland
AK Plaza Business Centre, Istanbul - Turkey

HOTEL
Domina Capanelle**** Hotel, Roma - Italy
Hilton***** Hotel, Barcelona - Spain
Siete Islas**** Hotel, Madrid - Spain
Novotel**** Hotel, Sofia - Bulgaria
Istanbul Gonen*****, Istanbul - Turkey
SPA Hotel, Lanzarote. Spain
Plaza**** Hotel, Lisbona - Portugal

RESTAURANT
Food Village at UCI, Casoria, Napoli - Italy
Maximilian's Restaurant, Novosibirsk - Russian Federation
Maximilian's Restaurant, Chelyabinsk - Russian Federation
Odith Cafe, Ufa - Russian Federation

MULTI-FUNCTIONAL BUILDING
Escala Yacht Club, L'Escala, Girona - Spain
Centro Meridiana, Lecco - Italy

CINEMAS
Movie Planet, San Martino Siccomario, Pavia - Italy

ENTERTAINMENT
Bingo, Alghero, Sassari - Italy
Miramare Bingo, Genova - Italy

MUSEUM
Archeological Museum, Pietrabbondante, Isernia - Italy
Quartzo Museum, Santa Apolónia, Lisbona - Portugal

TRANSPORT
Transportes Meropolitanos de Barcelona, Barcelona - Spain
Terminal 2 Milan Malpensa Airport, Varese - Italy
Alexander the Great Airport, Skopje - Republic of Macedonia
Cruise Terminal, Santa Apolónia, Lisbona - Portugal

SPORT
Deportivo Anaitasuna Sport Centre, Pamplona - Spain
Sports Hall, Buftea - Romania
School Gym, Soliera, Modena - Italy
Futurama Sports Centre, Volla, Naples - Italy
Città del Rugby Rugby Centre, Parma - Italy

HOSPITAL
Parque Tecnologico de la Salud Antonio Pozo, Armilla - Spain
Pirogov Hospital, Sofia - Bulgaria
San Pier Damiano Hospital, Faenza, Ravenna - Italy
San Martino Hospital, Messina - Italy
Terlizzi Sugery, Terlizzi, Bari - Italy
Nogara Hospita, Nogara, Verona - Italy
Sant'Ana Hospital, Lisbona - Portugal

DATA CENTRES
IBM Data Centre, Cerdanyola del Vallés - Spain

EXHIBITION CENTRE
Verona Exhibition Centre, Verona - Italy

RESIDENTIAL
Cenni di Cambiamento Residential Complex, Milano - Italy
Centro Meridiana, Lecco - Italy

INDUSTRY
Liebherr International AG, Sofia - Bulgaria
DIA.METRA Chemical Industry, Spello, Perugia - Italy
Pharmaceutical Warehouse, Reggio Emilia - Italy
Lamborghini, Bologna - Italy
Ayurpark Healthcare, Bangalore - India
Innopolis Stage Technopark, Kazan - Russian Federation

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