

## VULCANO BUONO

Nola, Naples - Italy

Multipurpose complex

Shopping Centre, Multiscreen Cinema, Hotel

WLHP System

**Year 2006**



A vegetation-covered concrete, steel and glass giant, conceived by one of the greatest contemporary architects and harmoniously located beside the real volcano in Naples. This is how Renzo Piano's Vulcano Buono arose in Nola. Inside, there is a shopping mall complex on several floors with an 80 checkout supermarket, shops and restaurants, free-time activities, exhibition and social centres, a multiscreen cinema and an international hotel.

### The Challenge

The integrated plan for a building of this kind had to take into account a dazzling number of technological and construction aspects; for each one, the best solution was decided from the possible alternatives.

The whole building is an architectural virtuosity of enormous dimensions, from the asymmetrical square which is one hundred and seventy metres in diameter, to its eighty enormous, differently-sized double structural rafters made of fused steel, to its gigantic inclined slope with no outward opening or roof in the traditional sense.

Despite the enormous thermal load to be dealt with, the air-conditioning system had to disappear within the structure, by avoiding exterior placement of the machinery. Only one circular corona-shaped covered terrace was available for this use.

At the same time, it had to guarantee comfort for all its intended uses, throughout the whole year and with the maximum working autonomy requested by each of the outlets on the premises. The system would have to go from one end of Vulcano Buono to the other, from its malls to its supermarket and shops, through the crowded restaurants and cinemas, to the modern hotel rooms.

Naturally enough, the enormous size of the complex required the careful control both of initial investment and management costs. These latter depended heavily on the energy efficiency of the chosen system.



*Vulcano Buono – View from the shopping mall and the square at night*  
Copyright © Studio Maggi / Moreno Maggi  
[www.vulcanobuono.it](http://www.vulcanobuono.it)

### The Building

- A 40-metre high volcano over a total area of 500,000 m<sup>2</sup>

### The Size

- 1 Auchan supermarket, 160 shops, 20 restaurants
- Warner Village 9 Screen Cinema
- \*\*\*\* Holiday Inn Hotel with 158 rooms

### The Team

- Architectural design Renzo Piano BW, Italy
- General design Favero & Milan, Italy
- Systems design Maire Engineering, 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

After careful analysis, the Vulcano Buono air-conditioning system was entirely entrusted to a WLHP, Water Loop Heat Pump, by Clivet

Only the Auchan supermarket has an independent system, for technical uniformity with the other structures in the group and due to the availability of a single roof. The sales area uses nine rooftop air-to-air heat pumps. Due to the particular conditions required, the food laboratories are served by air-conditioning units powered by two SPINchiller refrigerators, one of which is the *Brine* version, which supplies ice-cold water at 3°C.

All the other areas have autonomous heat pumps, connected to the loop circuit.

The larger commercial areas, such as the malls, and the medium-sized areas are air-conditioned by water-to-air rooftop heat pumps. These are single Freecooling devices equipped with Scroll compressors to provide free air-refreshment and motorised valves to reduce water consumption. Each shop in the mall, on the other hand, has one or two hanging water-to-air heat pumps available, usually installed in the storeroom and thus, not in view.

The Multiplex screens are also equipped with rooftop water-to-air heat pumps. Used for highly crowded environments, these type of pumps are able to hold up to 70% ambient air and are equipped with electronically controlled fans and thermodynamic, high efficiency energy recovery on the expelled air.

Four water-to-water heat pumps supply hot or cold fluid to the hydronic system for the hotel, which is also connected to the heat circuit. Endowed with a reversible refrigeration circuit, these units are also supplied with partial energy recovery, which can supply free hot water for sanitary use.

The whole building has ventilation units available for channelling the air-exchange along the complex installation paths in the structure.

## The Results

Thanks to the Clivet WLHP system, each individual setting automatically sets and maintains its own ideal climate year-round, independently of its own position, size or intended use.

In terms of the initial investment costs, the greater construction simplicity of the heat pumps and the *parcelling out* of their purchase to the individual shop owners resulted as a winning strategy.

As these machines are adapted to internal installation, no units can be seen on the Vulcano Buono slopes which are covered by three hundred and fifty thousand plants.

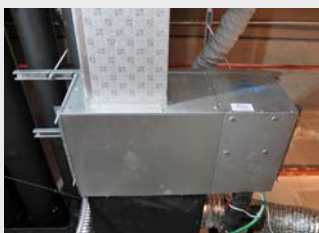
Management costs and the environmental impact have also benefited. Using the WLHP system, the air-conditioning is only activated when and where it is needed. In contrast to other systems currently in use, the loop circuit does not contain large amounts of cooling fluid, only water which is used to transfer the energy between areas with opposing thermal needs. The energy efficiency of the individual units is very high, thus reducing consumption. It is therefore possible to save primary energy, and up to 35% carbon dioxide emissions in comparison with traditional systems.

Clivet won the Italian Real Estate Award 2008 for the best Retail Development Project with Vulcano Buono.

*For further information about Clivet systems:*  
**[www.clivet.com](http://www.clivet.com)**



Vulcano Buono – View of 42 rooftop and one of the heat pumps for the shops



### The System

- 9 Clivet rooftop air-to-air heat pumps, for more than 250,000 m<sup>3</sup>/h processed
- 46 Clivet rooftop air-to-air heat pumps, for more than 1,000,000 m<sup>3</sup>/h processed
- 8 Clivet rooftop water-to-air heat pumps for densely crowded settings
- More than 240 Clivet ventilation and air processing units
- 4 Clivet water-to-water heat pumps for a total of 1,800 kW
- 2 supersilent SPINchiller refrigerators for a total of 600 kW
- More than 150 heat pumps for the shops
- The system is completed by four evaporative coolers for an overall 15 MW, three condensation water heaters 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 by rejection devices such as evaporative towers or dry coolers, while in wintertime boilers or heat pumps can support. The system lends itself well to integration with free or renewable energy sources.