PRIVATE HOUSE

Giussano, Milan - Italy

Flat

Retrofit

ELFOSystem

Year 2008

The flat, structured on two floors, is situated in a house built in the years '60 and composed by 4 housing units. In 2007/2008 the building has been subjected to specific interventions to increase energy efficiency, among which we remember the insulation with thermal overcoat and the replacement of the fixtures.

The flat has been completely restructured. The result is a flat different from the other housing units because of its modern aspect, ecology and energy saving, thanks also to the annual innovative air conditioning system; it is a perfect example of these system use also in existing buildings.

The house is located in the North Italy, where the climate is characterized by cold and wet winters and hot and sultry summers.

The challenge

The client's need, a young pair interested in ecological and energetically aspects, was the construction of a house for the future, taking care of the energy saving principles in order to have a low consumption and low environmental impact building.

Besides this need, a very high and homogeneous comfort level has been required in order to solve the problem of the different temperatures between the day zone (situated on the second floor) and the night zone situated on the attic.

Last but not least, the client wanted a system for the heating, cooling, air purification and renewal, domestic hot water production with a unique supplier and an integrated and ease management of all components.

Private House – View from outside and inside

The climate
- Continental climate (2547 degree days / Climatic area E according to Italian regulations)
- Winter project temperature -5°C

The Building
- House in 3 floors composed by 4 housing units
- Built in years '60
- Retrofit in 2007/2008
- Flat on two floors, one is an attic

The Size
- 140 m^2 in total

![CLIVET logo]

The solution

To satisfy the client's needs an hydronic system ELFOSystem Home by Clivet has been installed.

The heat pump ELFOEnergy Extended satisfies the summer and winter air conditioning needs. The domestic hot water production, with a storage of 500 litres, is satisfied by the heat pump and 3 solar panels.

The heating and cooling distribution in the rooms is made by the radiant panels. This solution allows the optimization of ELFOEnergy Extended and the system simplification. The heat pump produces water to the best temperature for the radiant panels according to the required loads and the external air, allowing the mixing group elimination.

The air renewal is guaranteed by ELFOFresh, that provides also important heat recovery actions and dehumidification in summer phase, fundamental for the radiant panel applications. This unit creates the climatic base of the house in every season, while the load peaks are satisfied by the heat pump. During the middle seasons ELFOFresh can operate in free cooling (off compressor) maintaining the local comfort with a very low energy consumption.

The system is completed by the centralized control ELFOControl, that manages all ELFOSystem components to obtain the perfect comfort in each room and the highest saving.

The results

Two kinds of systems have been offered to the client: a traditional system based on a condensing boiler + 2 split + cross-flow air renewal and an innovative system: ELFOSystem Home by Clivet.

ELFOSystem Home has been chosen for many reasons.

Clivet solution allowed the 15% of savings on the system costs than a traditional system installation cost.

Instead of a traditional system, ELFOSystem Home allows a saving, considering the annual consumption of gas and electrical energy (electrical energy 0.2€/kWh – methane gas 0.8€/m^3), of 500€ (that is to say 42%).

Also for the environmental aspects, the installed system guarantees many benefits, allowing a CO_2 reduction of 1500kg (51%).

The presence of a unique system with all components integrated, assures an higher reliability and an easier installation and management.

Not least, the system allows to have just a supplier.

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

Private house – Heat pump out of the building, air renewal unit on the ceiling, control system

The System
- Air-air heat pump ELFOEnergy Extended
- Air renewal ELFOFresh
- Three solar panels
- Distribution with floor radiant panels and with 2 thermo-furniture for the baths
- System control with ELFOControl
- Ambient thermostats
- Storage from 500 litres

Air renewal and purification with active thermodynamic recovery
The air renewal and purification ELFOFresh unit can recover the energy of the exhaust air in a more efficient way than traditional static and rotary heat recovery units. ELFOFresh does not recover "mechanically" the energy of the exhaust air with an heat ducted exchange between two separated air flows, but through an active thermodynamic process with a reversible heat pump circuit.
In opposition to the traditional cross-flow recovery units, that absorb high quantities of electrical energy because of the ventilation with high pressure drops, ELFOFresh saves ventilation energy thanks to the reduced pressure drops and to the high efficiency continuous current fans.
The efficient filtration system, based on the electrostatic filters, allows the reduction of harmful elements present in the outdoor air, eliminating over 95% of smoke, virus, bateria of diameter between 0.01 and 20 micron, a fundamental element for man health.
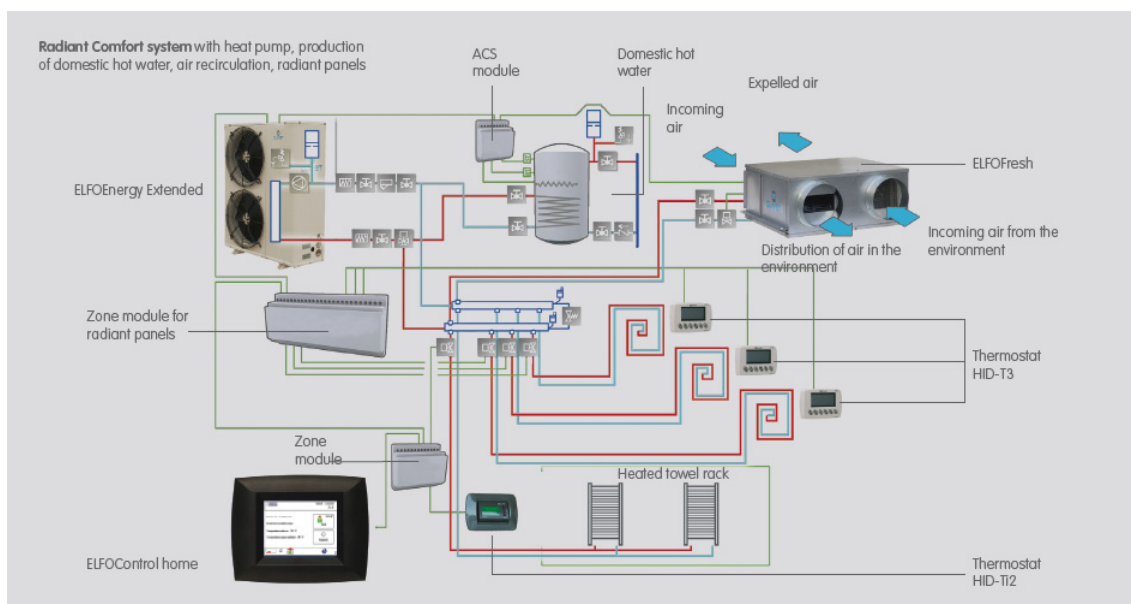
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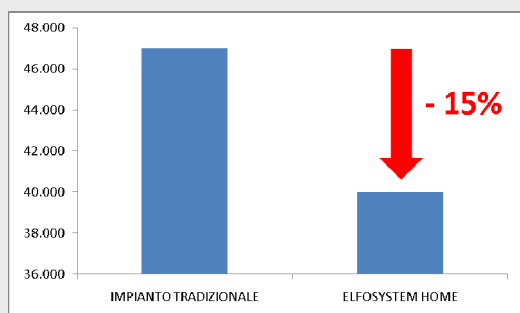- Winter project temperature -5°C

ELFOSYSTEM HOME system

- Air-air heat pump ELFOEnergy Extended
- Air renewal unit ELFOFresh
- Distribution with floor radiant panels and 2 thermo-furniture for the baths
- System control with ELFOControl
- Temperature and humidity ambient thermostats
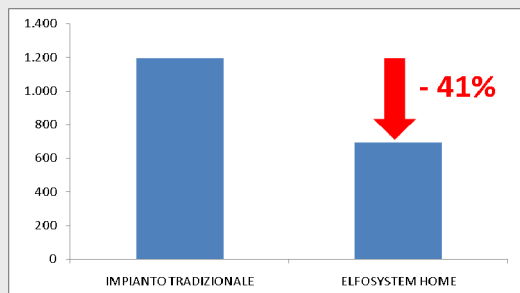- Storage from 500 litres
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COMPARISON BETWEEN THE INSTALLED CLIVET ELFOSYSTEM AND A TRADITIONAL SYSTEM (condensing boiler + 2 trial split+ cross-flow air renewal)

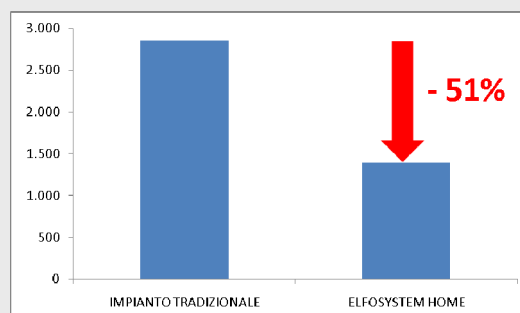### INVESTMENT COSTS (UNITS, MATERIALS, MANPOWER) (€)

- 15%

ANNUAL CO$_2$ EMISSIONS (kg)

- 51%

MANAGEMENT ENERGY COST (€)

- 41%

TOTAL PRIMARY ENERGY REQUIREMENTS (kWh)

- 47%

NOTE:
Electrical Energy cost: 0.2€/kWh
Methane cost: 0.8€/m^3
Conversion factor m^3 methane - kWh: 2.17