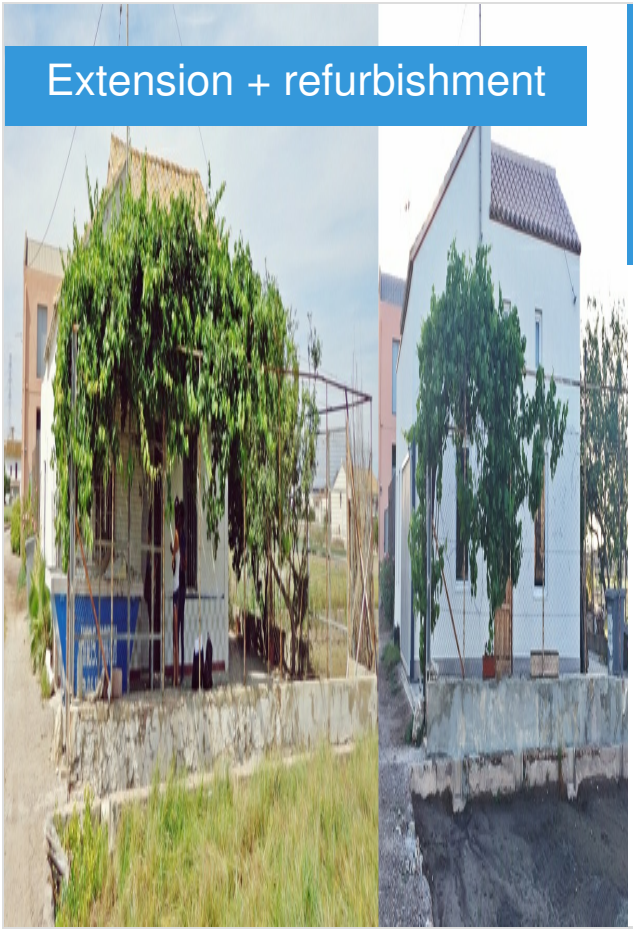
Refurbishment project of an Alqueria , in order to get negligible HVAC energy demand.

by Martínez Ana / 2017-06-08 16:03:10 / International / 7004 / EN



Primary energy need :

14.38 kWhpe/m².year

(Calculation method : Other)

ENERGY CONSUMPTION

Economical building *Building*

- *< 50* **A**
- *51 à 90* **B**
- *91 à 150* **C**
- *151 à 230* **D**
- *231 à 330* **E**
- *331 à 450* **F**
- *> 450* **G**

Energy-intensive building

Building Type : Isolated or semi-detached house
Construction Year : 1930
Delivery year : 2017
Address 1 - street : 46120 VALENCIA, Spain
Climate zone : [BSk] Mid-latitude Dry Semiarid (Steppe)

Net Floor Area : 120 m^2
Construction/refurbishment cost : 80 000 €
Number of Dwelling : 1 Dwelling
Cost/m2 : 666.67 €/m^2

Proposed by :

General information

The aim of this project is the refurbishment of a traditional Valencian orchard house, whose constructive typology is called Alquería, in order to achieve a negligible HVAC energy demand The objective of this project was defined considering the current worldwide energy and environmental situation and the risen cultural interest for the traditional edifications.

With that purpose, an energy model was developed using energy software TRNsys 17 following these consecutive steps:

· First the necessary data sets such as climatic data and construction building characteristics were collected and studied.

· Then, an original housing energy model was performed in order to get a validation of the model (RMSE 1.63°C, MAPE 5.88%).

· After that, an energy optimization strategy was proposed. The following step was implementation of energy efficiency measures.

· Finally, the corresponding results were carefully analyzed.

The overall conclusions obtained from the analysis were:

a) A good matching of the energy model is fundamental in order to reproduce the specific thermal behavior of the studied building

b) Enhancing the building envelope is the most effective proposal to achieve the reduction in the HVAC requirements of the building.

Finally with the application of passive measures (measures applied to the building which do not require additional energy) was gotten zero energy demand of active air conditioning (Heating Demand: 0.7kWh/year m^2, Cooling Demand: 2.2 kWh/ year m^2).

A Blower Door test was carried out for the purpose of verifies if the tightness level is the appropriate according to the Passivhaus standard. The result was 1.49 renovations per hour, satisfying the tightness demand for building rehabilitation according the Passivhaus standard.

Presently, the project is in the phase of the construction process, remaining to be done some finished and the fitting of shadowing devices. Any active HVAC system and heating recovery haven't been implemented.Pretending supply the HVAC requirements with natural ventilation in summer and with passive solar heating.

Coming, temperature and humidity sensors will be placed into of the house in order to prove if the house really has a nearly zero energy HVAC demand.

Stakeholders

Stakeholders

Function : Designer

Ana Martínez

Developing energy model by means of energy software TRNsys 17. Energy analysis through simulation in order to chose the most effectiveness energy efficiency measures.

Function : Construction company

Salmer restauracion y conservacion, S.L.

Energy

Energy consumption

Primary energy need : 14,38 kWhpe/m^2.year

Primary energy need for standard building : 54,52 kWhpe/m^2.year

Calculation method : Other

CEEB : 0.0005

Breakdown for energy consumption : The house is in refurbishment process yet.
Energy model was developed using energy software TRNsys 17.
HVAC demand simulations results were:
With heating recovery system implemented: Heating Demand: 0.7kWh/year m2, Cooling Demand: 2.2 kWh/ year m2.

Without heating recovery system: Heating Demand: 7.4kWh/year m2, Cooling Demand: 2.8 kWh/ year m2.

Initial consumption : 1,00 kWhpe/m^2.year

Envelope performance

Envelope U-Value : 0,17 $W.m^{-2}.K^{-1}$

More information :
Have been placed in all of the façades and the deck thermal insulation. In the walls has been disposed on the external face by means of SATE system.

Building Compactness Coefficient : 1,90

Indicator : EN 13829 - n50 » (en 1/h-1)

Air Tightness Value : 1,49

More information

Before the renovation process, the house was uninhabited and in ruins, therefore there aren't any data concerning energy consumption.
On the other hand, currently, the house is in refurbishment process, so does not exist any data concerning primary energy consumption.

Renewables & systems

Systems

Heating system :

- No heating system

Hot water system :

- Individual electric boiler

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation

Renewable systems :

- Solar Thermal

Other information on HVAC :

Any active HVAC system and heating recovery haven't been implemented. Pretending supply the HVAC requirements with natural ventilation in summer and with passive solar heating according with simulation results.

Will be implemented a solar thermal energy system

Solutions enhancing nature free gains :

Have been placed south-facing windows to get a passive solar heating. Cooling requirment will be supplied with natural ventilation.

Environment

Urban environment

The building is situated in a growing area closet to irrigation ditches, also is near to the coast and to the Universitat Politècnica of Valencia.

Products

Product

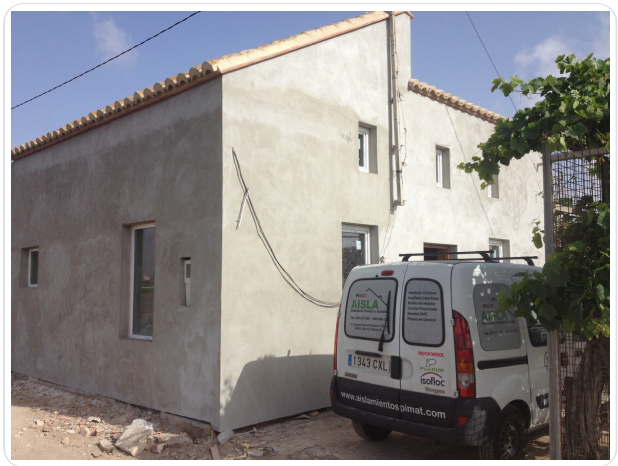
External Thermal Insulation Composite System

Aislamientos PIMAT

C/ Sequia Real del Xuquer 8, 46260 Alberic, Valencia

http://www.aislamientospimat.com/

Product category : Second œuvre / Cloisons, isolation



El Sistema SATE: Sistema de Aislamiento Térmico por el Exterior (en inglés ETICS: External Thermal Insulation Composite System), es un sistema EPS de aislamiento térmico y acústico de fachadas por el exterior. Mientras que otros aislantes se incorporan a la fachada mediante una obra, el Sistema SATE se trata de un panel de aislamiento prefabricado que se adhiere a las fachadas por fijación mixta (mediante fijación mecánica y adhesiva) por lo que dota a la fachada de una envolvente térmica que mejora la eficiencia energética y minimiza la fuga de calor y la entrada de

humedad.
Como resultado de su composición de poliestireno expandido el sistema SATE es un panel aislante que proporciona aislamiento térmico en el exterior de la vivienda. Además cuenta con un revestimiento armado y al mortero acrílico.
Como resultado, el Sistema SATE (Sistema de Aislamiento Térmico por el Exterior) presenta estas ventajas:
Aislante térmico que disminuye la perdida de calor en invierno hasta un 70%.
Aislante térmico que reduce el calentamiento interno en verano hasta en un 30%.
Aislamiento acústico.
Resistencia al impacto solar.
Protege la fachada de la intemperie (larga durabilidad).
Garantiza la transpiración de la fachada.
Reduce el riesgo de condensaciones.
Instalación en el exterior de la fachada (no consume m² internos).
Bajo coste de mantenimiento (apenas necesita).
Impermeable.
Incombustible (A1)
100% Natural
Fácil y rápido de instalar
Permite gran variedad de acabados, incluso colores oscuros.
Por lo tanto, Aislamientos PIMAT considera que este Sistema SATE es un sistema de aislamiento térmico idóneo tanto para las nuevas construcciones como para rehabilitar fachadas exteriores deterioradas ya que otorga una mayor capacidad aislante térmica y acústica. Además, mejora la resistencia a agentes externos y apenas necesita mantenimiento.

This product was very appropriate because it was been able to install easily, and it present a very high resistance to heat transfer.

Costs

Health and comfort

Indoor Air quality

Is assured through the natural ventilation according to the necessities of the owner.

Comfort

Health & comfort : During the simulation study was defined a complex strategy of energy optimization in order to achieve the best option of the energy saving measures analyzed, avoiding unfavorable effects, being the aim get a health and confort indoor conditions for the customers.

Measured thermal comfort : The results of the simulation shows that the almost 84% of the hours in one year the indoor temperatures are in confort zone (Temperatures between 26▼C and 21▼C).

Contest

Reasons for participating in the competition(s)

Valencia climate is a typical Mediterranean climate which is classified like BSk according to the climatic classification of Köppen-Geiger.

According with the climate of the zone using the appropriate measure in order to avoid a active HVAC system in other words getting a building with negligible energy HVAC demand.

The house is in refurbishment process yet.

Building candidate in the category

Energy & Temperate Climates

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