Category: Energy efficient private house
Case Study: Private house in Ialissos

GREECE

Development Agency of South Aegean Region «READ S.A.»

Project cofinanced by
European Regional Development Fund

Lead Partner
Provincia di savona

Sustainable Construction in Rural and Fragile Areas for Energy efficiency

Category: Energy efficient private house

Case Study: Private house in Ialissos

Sustainable Construction in Rural and Fragile Areas for Energy efficiency

The village of Ialissos in the map of Rhodes

The private house in Ialissos

General Information

Situated in the north-west side of Rhodes in Ialissos, the constructors of this 400 m2 private house have adopted and applied several rules of sustainable building. “Water solutions” is the responsible constructing company of this project and is based in Rhodes.

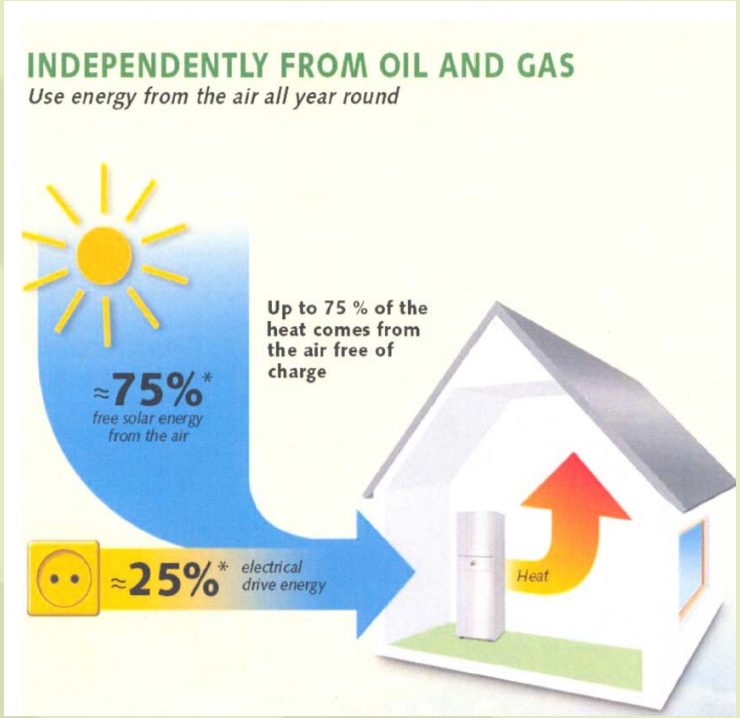
Presentation

More specifically, the system that has been applied in this case study includes the following practices:

- Heat Pump System air to water
- Floor heating
- Pool heating
- Figure 3: The village of Ialissos in the map of Rhodes
- Fan Coil (Cooling) Water heating
- Water treatment
- Exploitation of rain-water
- Solar Thermal System 800Lt

Category: Energy efficient private house

Case Study: Private house in Ialissos



The use of solar energy and electricity

By using a solar thermal system, the need of conventional energy fuel supplies are drastically reduced and as a result large profit is achieved, while we contribute to environmental protection.

The operation of this system is quite simple:

The system consists of two main units, the collectors of a total surface of 12,5 m2 is located on the roof and the storage tank that has a capacity of 800Lt is situated at the engine room of the house. An antifreeze solution (solar liquid) is exposed to solar radiation and fed to circulate in a well insulated container. The heat of solution is transferred to the water in the container, which after being heated, is used as hot water or as a source of energy for floor and pool heating. The solar fluid recirculation station built into this system offers maximum utilization of solar heat collectors and through the Controller the constructors collect data and manage the whole system.

The system is equipped with fresh water production unit (FWM - Fresh Water Module) that offers immediate hot water and prevents the creation of legionella bacteria.

Through this complete solar thermal system the users cover 100% of their needs for hot water from April to October and up to 80% over the year as well as 50% of their needs for floor and pool heating

Category: Energy efficient private house

Case Study: Private house in Ialissos

The exterior of the house

- **Ecological Heat Pump 30KW**

Energy source for heating, cooling and hot water is an ecological heat pump using inverter technology with power of 30KW and rated efficiency 4.7. This means that it consumes 1KW of electricity and offers a thermal or cooling load of 4.7KW. It does not use fossil fuels, but only electricity.

Heat pumps constitute the most economical and ecological solution for central source of energy for heating, cooling and domestic hot water use. Solar energy that is stored in the air is an inexhaustible source of energy. The heat pump installed in this house can get 75% of its energy needs from wind and only 25% is supplied by electric power.

Whenever the thermal energy from the sun is not enough for the floor heating, pool and hot water usage, the heat pump starts operating in order to give the remaining amount of required energy as economically as possible while protecting the environment. It is also switched on when the users want to cool the house through the installed Fan Coil units.

Category: Energy efficient private house

Case Study: Private house in Ialissos

Floor heating

- **Floor Heating**

Under floor heating is the most environmentally friendly method of heating. To achieve the desired temperature in the under floor heating, water flow between 30oC - 40oC while in common radiators the temperature is between 70 ° C to 80oC. This difference in temperature results in fewer hours of operation of the heat pump and therefore lower power consumption.

Moreover, space heating through under floor system offers healthier living conditions. The piping system achieves optimal heat distribution on the human body (warm feet - cold head) and it prevents air currents that are generated by the common radiators, resulting in lack of dust and maintenance of the humidity of the air space to a normal level.

- **Exploitation of rainwater**

Through the vertical and horizontal network of the house, water falls in a well for aquifer recharge. Water is pumped from the well in order to irrigate the garden and fill in the flash tanks of the WCs, saving huge amounts of drinking water.

Category: Energy efficient private house

Case Study: Private house in Ialissos

The machine station

Sewerage System

The house has also been connected to the central sewer network of the city and does not use septic tank.

Drinking Water Treatment

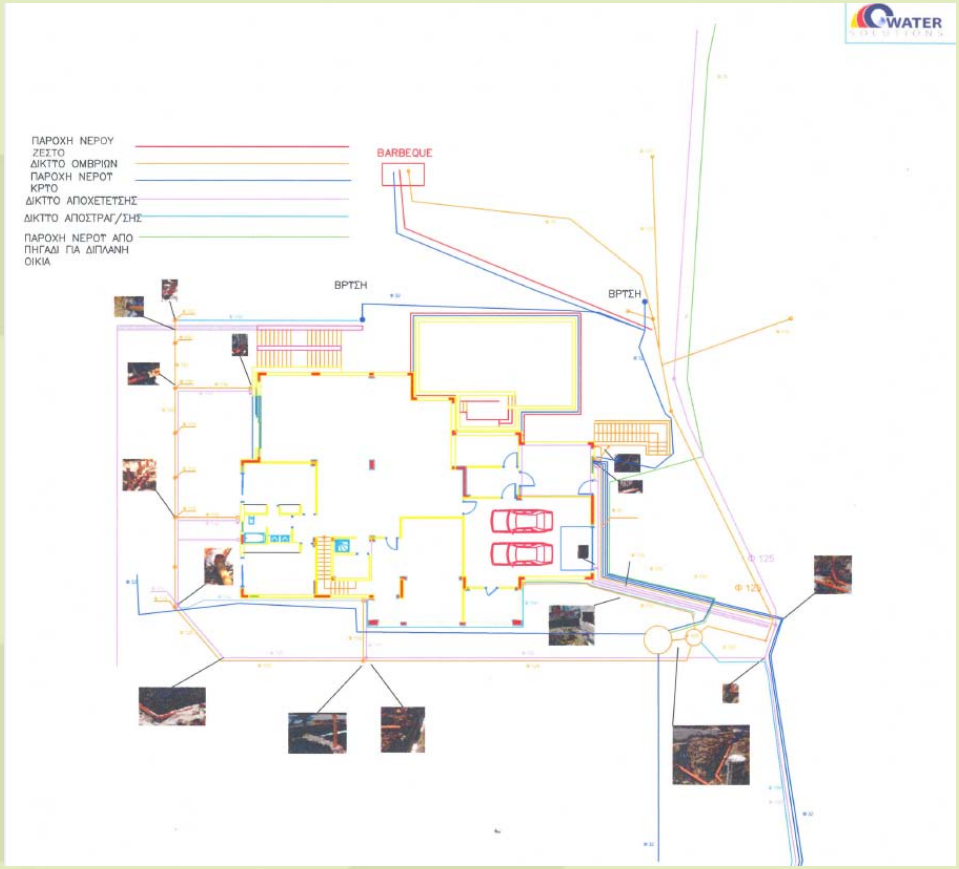
For the treatment of drinking water the constructing company installed an integrated filtration system consisting of the following parts:

Self-cleaning water filter with a flow capacity of 4,5 m3 / h. It contains silver plated mesh from 2mm up to 30 microns for antibacterial protection

Electronic softener for permanent supply of soft water. It provides up to 80% less salt consumption, reduces detergent consumption and energy. Filter of active magnesium carbonate which removes mechanical impurities of water, chlorine and poisonous compounds, lead and toxic heavy metals, organic compounds, microorganisms, bacteria, fungi, pesticides, detergents and phenols.

Category: Energy efficient private house

Case Study: Private house in Ialissos



The plan of the house

Evaluation

Nowadays, modern societies are characterized by an increasing awareness concerning the protection of the environment, because of strict regulations, financial and other influences, as well as the environmental consciousness expressed by consumers. In a highly competitive environment, everyone must be aware of the urgency of our compliance with the new conditions and the need to turn nature's protection into a part of our everyday life.

The advantages of the bioclimatic and energy efficient design are the following:

- Environmental protection through the reduced pollutants and greenhouse gas emmissions
- Energy saving, thermal andvisual comfort
- Money saving thanks to the reduced need for fuel and cost of heating, cooling, ventilation, lighting
- Improvement in the quality of life

Basic elements of bioclimatic design are passive solar systems that use environmental sources, such as sun, air, wind, vegetation, water, for cooling, heating, lighting the buildings.

The energy consumption of a building depends not only on the quality, the materials of the construction and the technical installations, but also on the rational behavior of its users.

Category: Energy efficient private house

Case Study: Private house in Ialissos

Solar Panels

Evaluation

The appropriate planning and design of a building leads to great energy savings, regarding the orientation, the size and the location of the windows and openings, the protection of the building's shell with the right type of insulation etc. Particularly important is adequate shading and natural ventilation during the period of summer and the oposite techniques in winter, in order to achive a stable temperature.

Energy savings through bioclimatic design vary depending on the type of the building, the region's climate and the technologies used. The application of energy efficient techniques does not increase the construction's cost if the systems are simple. The implementation of more complicated techniques can increase the total cost by 10-15%. As for interventions in existing buildings, there is always an additional cost, which can be considered as part of the overall cost of renovation or reconstruction of the building.

To sum up, the application of environmentally and energy friendly techniques in the island of Rhodes is rather encouraging and sets a very interesting example for other initiatives, too. More motivations from the state's side are required, especially during this period that the financial conditions are extremely difficult and prohibitory for rnovations or construction of new energy efficient buildings.

Category: Energy efficient private house

Case Study: Private house in Ialissos

The artificial plumping system

Potential for transferability

The presented good practice constitutes an undisputed proof that even islands have realised the importance of this shift towards building techniques. In a sector that is responsible for the 40% of total energy consumption in the European Union similar steps have to be made in order to achieve a significant limitation in the use of energy in everyday life.

It is a remarkable fact that in Greece an average household needs 340% more energy for heating than a household in Finland, if we take into consideration the average temperature of these two countries. From the above percentage it can be assumed that the buildings in Greece have inadequate thermal insulation and the use of energy cannot be characterized as rational. Therefore, apart from the reconstruction of more energy efficient buildings and the energy saving interventions that can be applied in the older ones, there is a significant lack of information and awareness from the part of the citizens.

The energy efficient building that was presented in the embodies several methods that could be applied both in new and in older buildings, aiming at improving their energy footprint.

Category: Energy efficient private house

Case Study: Private house in Ialissos

Fan Coil (Cooling system)

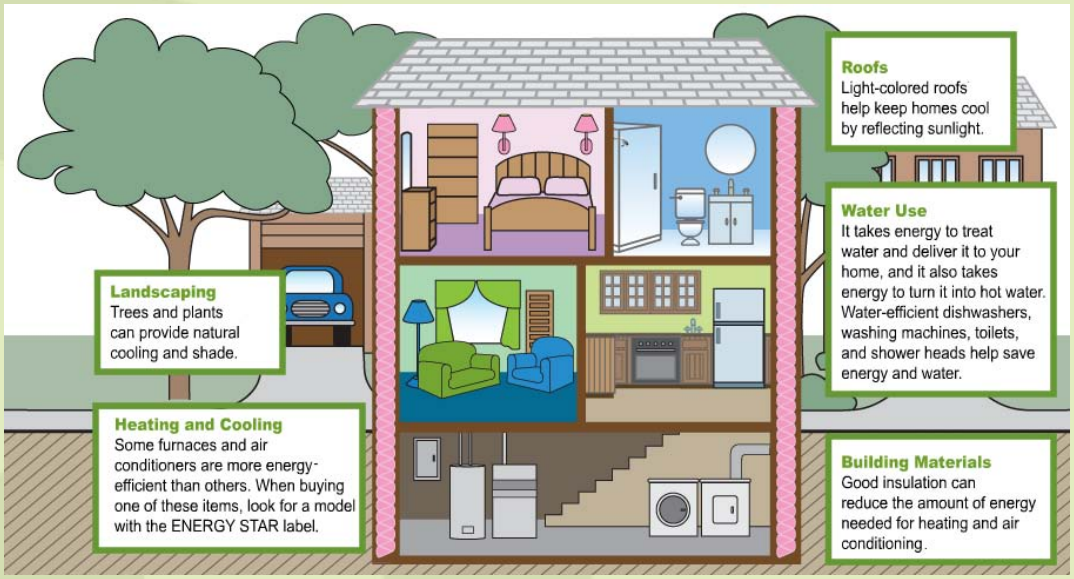
The methods that were applied in the house in Ialissos for environmentally friendlier space and water heating, lighting, cooling, ventilation and shading could also be a part of the renovation of older buildings or the construction of new ones. Even if the installation of several energy saving systems is more expensive compared to the conventional methods, the actual profit is more important due to savings in energy and natural resources which is interpreted as reduced costs.

Even if it is not possible to spend large amounts in the establishment of new appliances and systems, there are also several no or low-cost techniques that are effective and result in the reduction of energy consumption.

One of the most important principles that has to be taken into consideration when constructing An energy efficient building, is its orientation that determines its behavior concerning weather conditions. Bioclimatic architecture pays attention to this feature as lighting, heating and ventilation depend on it.

Category: Energy efficient private house

Case Study: Private house in Ialissos



Green Building applications

The improvement of the energy performance of a building is achieved thanks to the three categories of interventions:

- Extended reconstruction that can be done in case of total renovation, like the replacement of windows and frames, adding insulation materials, installation of exterior passive systems or conversion of conventional building materials in passive components (e.g. transforming a simple wall in solar wall), external shading systems (stable or mobile), etc.
- Small low-cost interventions such as limitation of cracks, indoor shading systems, ceiling fans, planting for shading, replacing incandescent light bulbs with low energy consumption bulbs, etc.
- Non-technique interventions, such as proper operation of building systems, including proper use of windows (natural heating in winter, shading and night ventilation in summer), rational use of electric devices in order to avoid thermal charge of the building (e.g. avoid cooking during the hours that the temperature is high).

Category: Energy efficient private house

Case Study: Private house in Ialissos

The interior of the house

Sources- Bibliografy

- http://www.edpenergy.com/index.php?option=com_content&view=article&id=71:2011-04-06-11-36-28&Itemid=&lang=en
- http://teeic.anl.gov/er/conserve/savebldg/index.cfm
- http://www.lamarquise.gr/environmental-policy_3847.htm
- http://www.cityofpetaloudes.gr/index.php?option=com_content&view=article&id=11458:pagkosmia-diakrisi-epivraveusi-roditikis-etairias&catid=136:verenagr&Itemid=73
- http://www.cres.gr/kape/energeia_politis/energeia_politis_bioclimatic_faq.htm
- http://www.ucsusa.org/clean_energy/technology_and_impacts/energy_technologies/how-solar-energyworks.html
- http://www.ypeka.gr/Default.aspx?tabid=525
- http://www.ypeka.gr/Default.aspx?tabid=282
- Centre for Renewable Energy Sources and Saving (CRES), “Bioclimatic design in Greece: Energy efficiency and guidelines for implementation”, Altener project, Pikermi, Greece, September 2002
- M. Founti, D. Kolaitis, D. Giannopoulos, “Energy saving for buildings”, National Technical University of Athens, Athens, 2009
- Presentation of the private house in Ialissos by the mechanical engineer of “Water Solutions”

Project cofinanced by

European Regional Development Fund

Lead Partner

- Province of Savona (ITALY)

Project Partner

- Region of South Aegean (GREECE)
- Read S.A. (GREECE)
- Local Energy Agency Pomurje (SLOVENIE)
- Agência Regional de Energia do Centro e Baixo - Alentejo (PORTUGAL)
- Official Chamber of Commerce, Industry and Shipping of Seville (SPAIN)
- Rhône Chamber of Crafts (FRANCE)
- Development Company of Kefalonia & Ithaki S.A. - Kefalonia (GREECE)
- Chamber of Commerce and Industry Drôme (FRANCE)
- Cyprus Chamber Of Commerce and Industry (CYPRUS)
- Chamber of Commerce & Industry Marseille Provence (FRANCE)

SCORE

Sustainable Construction in Rural and Fragile Areas for Energy efficiency