EFFICIENT SOLUTIONS AND WELL MANAGEMENT OF ENERGY IN BUILDING STRUCTURES

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Abstract

Energy is the key to economic and social development of a nation. Today the world is intended to be produced or used new technologies with higher productivity and a more efficient use of energy to reduce global energy consumption without compromising the needs of humanity. In this battle, energy efficiency in buildings can be seen as one of the fastest and most effective tools towards a sustainable tomorrow. In the recent years interventions for reducing energy consumption are divided as follows:1. Construction - Thermal Insulation. 2. Implantation - Use of plants with high efficiency. 3. Maintenance - Regular cleaning of the interior surfaces of plants. 4. Usage - Saving energy interior environments are not frequented. Designing with rational use of energy must control three aspects: 1. Environmental. A design that fits the local climate. 2. Typology. The ratio surface / volume favorable, orientation and design of transparent surfaces in relation to the wall surfaces and in relation to the sun to maintain a satisfactory level of natural lighting. 3. Technical- Constructive. The presence of a thermal insulation and efficient use of doors and windows with good technical features, to use passive solar energy directly or indirectly. Energy efficiency of existing buildings can be improved with small investments, such as re-designing lighting, improving window insulation and installing a heat recovery system or heat pump. In new buildings, energy efficiency is a “must do” in all cases. Today we intend using the "Passive House" which is a standard that supposes a building energy consumption with internal thermal heating (<15kWh/m2). So for a "Passive House" we spend about 50% of total energy consumed in a traditional home or condominium.

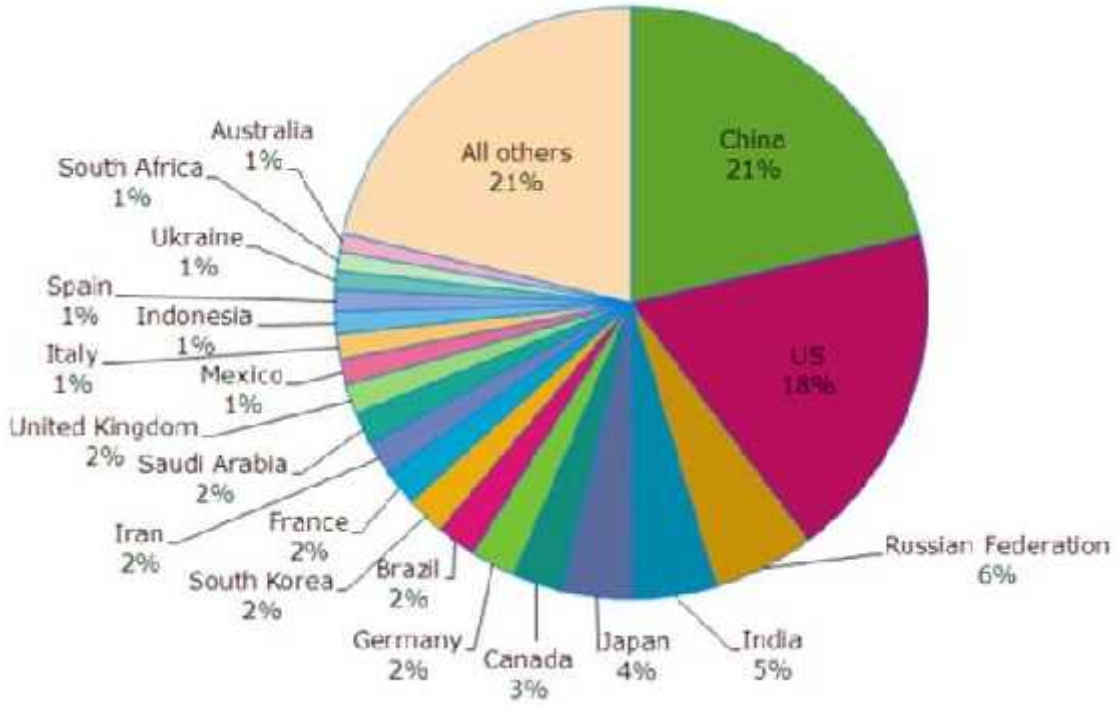
Keywords: *energy, efficiency, insulation, maintenance.*

Introduction

Energy is the key to economic and social development of a nation. Today the world is intended to produce or use new technologies with higher productivity and moreefficient use of energy to reduce global energy consumption without compromising the needs of humanity. In this battle, energy efficiency in buildings can be seen as one of the fastest and most effective tools towards a sustainable tomorrow.

This strategy is evident today knowing that fossil originated energy resources like and gas are running out, and the rapid growth of energy consumption in emerging economies like China, India, etc. has enormous potential of optimizing energy consumption in all economic areas of our planet.

The chart below shows the differences in the intensity of energy in large areas of the global energy consumption.

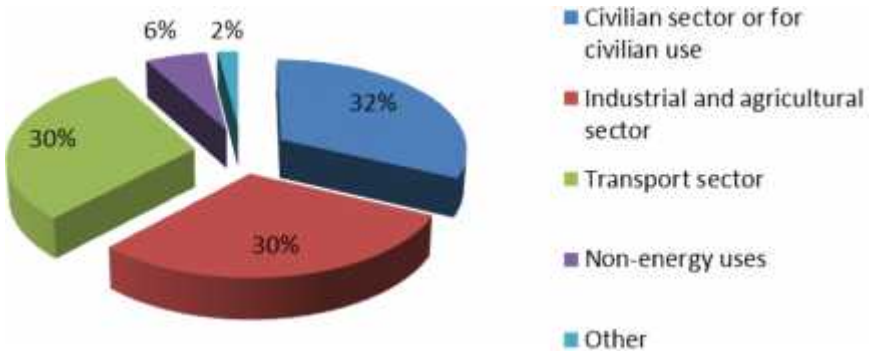


We see that the European economy is the leader in the field of advanced technologies with high efficiency in the use of energy.For example, in Italy the reduction of energy consumption of fossil origin is already a state objective (it imports 85% of energy resources). Based on the chart, the energy intensity difference creates the idea that Italy is a country with high energy efficiency but not so.

The civil sector has a lower efficiency than the European average of energy consumption, while industrial sector has an optimal efficiency of energy use.In Italy 93% of energy consumption is provided by fossil energy sources, which are realized by imports of oil and gas.A study conducted by the Environmental Institute of Stockholm assumed or predicted that in 2030 the population of Italy will go to 58.3 million.The average mileage of vehicles will be 15000km/year, 70% of house and 95% of the offices will be air-conditioned.

In 2005, energy consumption in Italy has reached 146Mtep and is mainly divided into three sectors:

- 32% in the civilian sector or for civilian use.
- 30% in the industrial and agricultural sector.
- 30% in the transport sector.



Efficient technologies and solutions in building structures.

Energy use in the civilian sector includes:

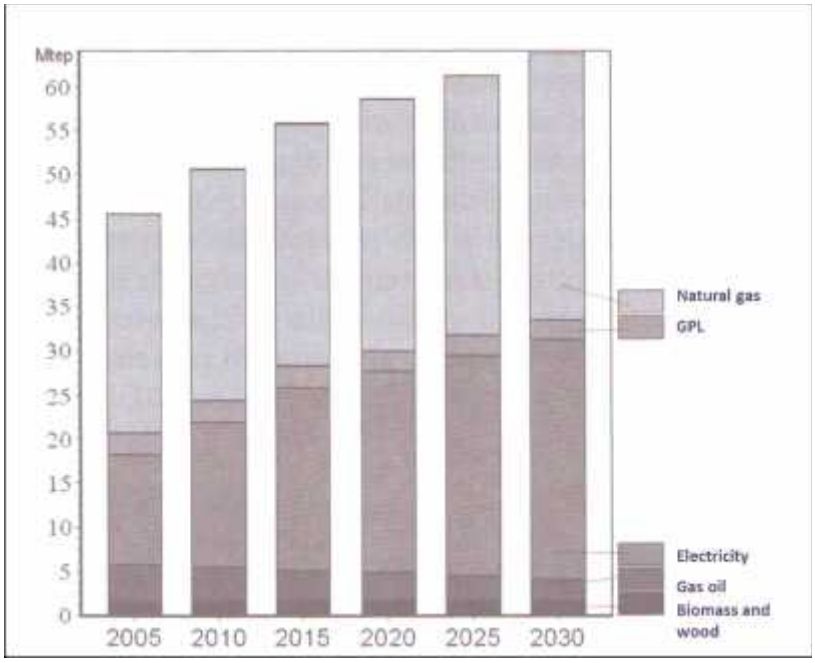
1. Apartments.
2. Public services.
3. Private commercial activity.

We noticed in this sector even larger losses of energy especially in public services.In Italy in 2005 the annual energy consumption of the civil sector amounted to Mtep 45.79, or almost a third of the total consumption.

This energy was consumed for:

- 61.7% for heating spaces.
- 9.5% for sanitary hot water.
- 3.3% for lighting (street lightingincluded).
- 5.7% for the air conditioning.
- 15% for the operation of electrical appliances.
- 4.8% for the preparation of food.

Energy consumed in the civilian sector in Italy in 2005 was obtained from the following sources of energy.



- Natural gas covered 54.2% of final energy consumption needs.
- Electricity 27.4%.
- Oil 15%.
- Gasoline 3.4%.

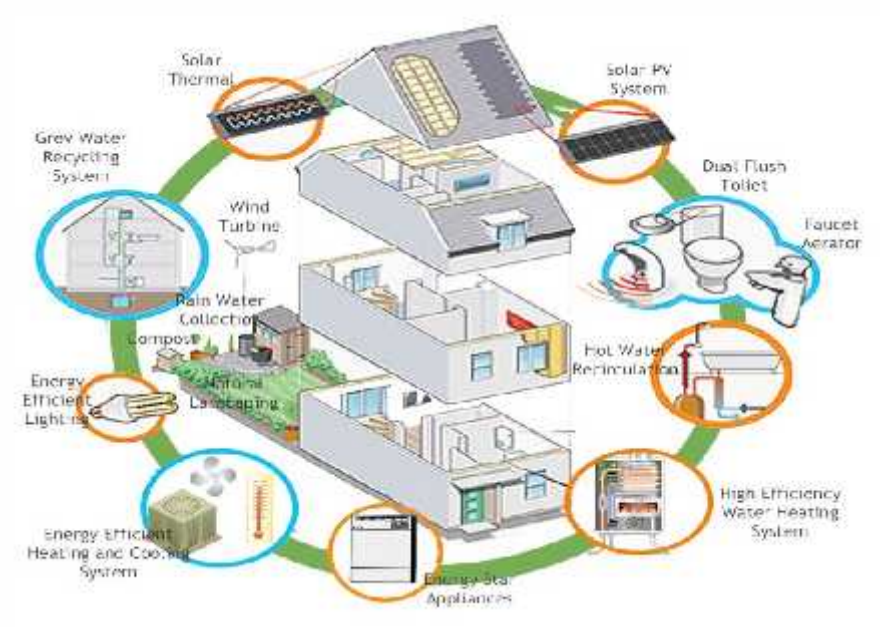
In the recent years, interventions for reducing energy consumption are divided as follows:

- Construction - Thermal Insulation.

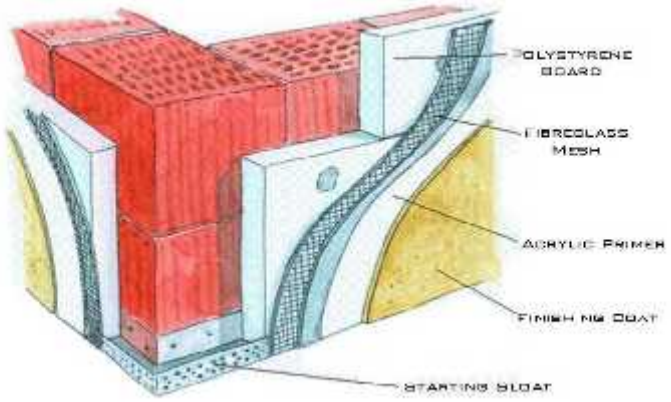
Thermal insulation of floors and roofs, floors and walls of circumference areas.Using the appropriate doors and windows with double glazed windows or triplex.Correct sun orientation of the building, using the sun's energy by orientating windows southward.

- Implantation - Use of plants with high efficiency. Using solar panels.
- Maintenance - Regular cleaning of the interior surfaces of plants.
- Usage - Saving energy wheninterior spaces are not frequented.

This figure evidences one example of efficient use of energy for a family type without renouncing any comfort of modern society.



Thermal insulation is one of the priority interventions that saves energy.



Designing with rational use of energy must control three aspects:

1. **Environmental.**

A design that suits the local climate, taking into consideration the seasons (temperature, relative humidity, wind, etc. defined by climatic data rates).A design regarding the location of the building taking into consideration the characteristics of the surrounding area (morphology, noise pollution, the environment, water, etc).

2. **Typology.**

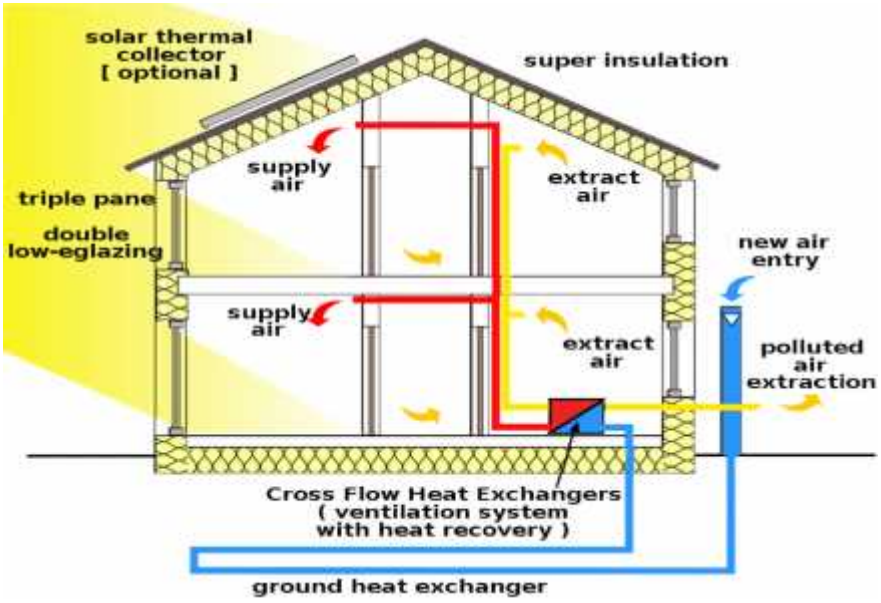
The ratio surface / volume favorable, orientation and design of transparent surfaces in relation to the wall surfaces and in relation to the sun to maintain a satisfactory level of natural **lighting.**

3. **Technical- Constructive**

Effective technical isolation and use of doors and windows with good technical features. Passive use of solar energy directly or indirectly.Use of high-performance technologies (heat pumps, electrical equipment with low energy consumption).

Energy efficiency of existing buildings can beimproved with small investments, such as re-designing lighting, improving windowinsulation and installing a heat recovery system or heat pump. In new buildings, energyefficiency is a “must do” in all cases.

Today we intend using the "**Passive House**" which is a standard that supposes a buildingenergy consumption with internal thermal heating. The "Passive House" uses a combination of low-energy building techniques and technologies.So for a "Passive House" we spend about 50% of total energy consumed in a traditional home or condominium.



Energy Institute (PASSIVHOUS) in Darmstadt (Germany) has defined these parameters that a building should have to be considered "Passivehouse":

- Thermal heating consumption ≤ 15kWh/m^2year.
- Total used energy ≤45kWh/m^2year.
- Total thermal conductivity of building ≤0.8 kWh/m^2year.
- Lack of thermal bridges.
- Controlled ventilation with 75% heat recovery.
- Air impermeability.
- Hygrometricbehavior.

The dark colors on this thermo gram of a **Passive house**, at right, shows how little heat is escaping compared to a traditional building to the left.