

Study of Solar Energy Usage in Green Buildings

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Abstract— Today, given the population growth in the world, we witness development of industry sector, particularly building construction industry, so as on the one side, we are confronted with fuel consumption increase and consequently uncontrolled production of buildings' environmental contaminators and on the other side, non-observance of the standards and non-insulation of many buildings as well as increase of fuel consumption caused by technical defects of buildings and household appliances have worsened the current situation. For this reason, in recent decades, researchers have succeeded in solving lots of the existing problems by means of solar energy and achieving desirable results. In this study, constituents such as non-production of greenhouse gasses, reduction of conventional consumed fuels, environment friendliness, use of safe and pure energy can be considered the reason to justify application of solar energy in building construction industry (Solar buildings).

Key words— Green Building, Air Pollution, Solar Energy.

I. INTRODUCTION

MOST existing buildings consume and waste energy beyond the allowed limit which is the result of non-observance of the existing laws and professional codes. Almost, all of the country's existing buildings one way or another use fossil fuel for heating and cooling in different seasons of the year and non-insulation of windows and non-use of two-layer windows and sealants and building's inappropriate direction etc have given rise to increase in fossil fuel consumption and along with it we witness increase in amount of contaminators and air pollution which from economic point of view causes governments to incur heavy expenses. However, the modern society feels the need for use of pure and renewable natural energies, particularly in building construction industry and considers it very crucial in achieving sustainable development. Solar energy, given its special properties, such as purity, high safety, very cheap price, and availability is recommended as one of the suitable solutions for this purpose.

II. USE OF SOLAR ENERGY IN BUILDINGS

Solar energy is among renewable energies. It means that its reservoirs without running out can be used. Use of solar energy in place of current systems which work with fossil fuels reduces the existing CO₂ and other polluters, and cost and cuts dependence on other countries. In addition, it reduces the dangers caused by gas poisoning (asphyxiation)

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and explosion, saving in time of gas, electricity and other energies' bill payment. Solar energy possibilities are a function of different climatic areas in which study of such factors as characteristics of sun radiation, rainfall, humidity, temperature condition, amount and condition of wind, and insulation specifications are indispensable. In a solar plan, the way of its designing for minimization of thermal losses and optimal use of the obtained energy is very important [1, 2].

The concept of green building is a combination of extensive connection between the building and energy researches throughout the world. Green buildings' outlooks are examples of ecology application in which designers have taken into consideration ecosystems' principles, organization and structure and architectural effects. By profiting from these concepts, methods and language in the environment, designers are put in the position to create an architecture in which mainly a natural system is involved [3]. In order to reduce fossil fuel consumption in green buildings, use of renewable energy such as solar and wind energy, and the energy obtained from the earth central heat is of high importance and is recommended. Solar energy, due its purity, abundance and easy availability has been widely taken in to consideration. Figure 1 shows exterior (view) of a solar building (green building) [4].



Fig. 1. An exterior view of solar building [4]

III. SOLAR ENERGY RECEIVING METHODS BY BUILDINGS

Solar energy receiving by buildings normally is effected through two inactive and active methods.

A. Inactive system

In this system, building's heating is effectuated naturally and by means of natural factors such as the sun which leads to reduction in fossil fuel consumption. In this system, reception and storage of solar energy depends on the way the building's structure is designed. Inactive solar heating methods are:

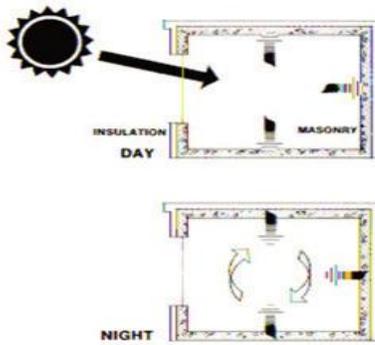


Fig. 2. Windows (if possible, in two layers) in south, south-western and south-eastern side of the building [1]

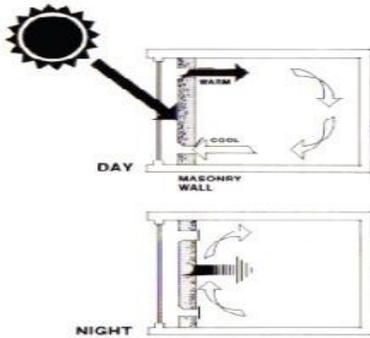


Fig. 3. Windows absorbing the sun's light [1]

- (1) Direct method (sun's light directly enters the building through window). In figures 2 and 3 a schema of this method is shown.
- (2) Indirect method (the wall storing solar energy (thrombus wall) and water wall)
- (3) Use of neighboring greenhouse which in figure 4 it is referred to.
- (4) Pool or basin on the roof. Figure 5 indicates this feature.

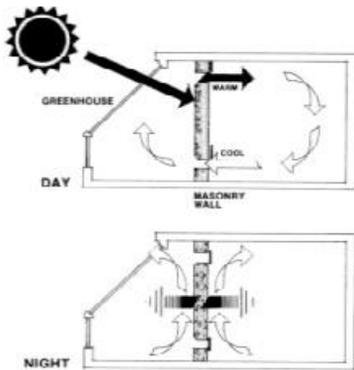


Fig. 4. A schema of greenhouse method [1]

B. Active system

This system uses solar energy collectors which are available in two water-heater and photovoltaic types. This is shown in figure 6.

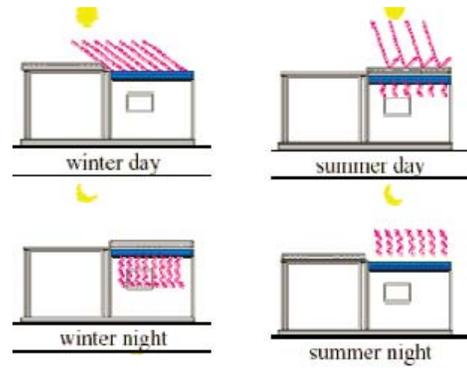


Fig. 5. A schema of pool on the roof [1]



Fig. 6. A view of collector of water-heater type

IV. APPLICATION OF SOLAR ENERGY IN BUILDINGS

Given the obtained results, collectors can be installed and used in balconies, sunshades, beside houses' roof (where the solar system is part of building's general design). From this system approximately about 70% of building's annual energy, given different climatic conditions, can be provided. Figure 7 gives a view of the collector which has been installed in the building's sunshade [5].



Fig. 7. A picture showing use of collector in the sunshade [5]

Solar energy is often used to provide the consumed hot water, needed heating and cooling, and light. Figure 8 is a picture of heating pipes which are from the floor and its heat is provided by solar energy.



Fig. 8. A picture of heating pipes from the floor [5]

V. CONCLUSION

Considering that solar energy does not produce greenhouse gasses and other pollutants and considering its safety, purity, abundance and easy availability as well as its economic justification and renewability, by use of this green energy and resolving the existing problems, a further step towards sustainable development can be taken. We hope that given adoption of new policies by the government to witness further development and promotion of solar building in the near future.

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