Optimization of Energy Usage by Designing Solar Buildings

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Abstract: One of the important issue's today's scientific worlds is the topic of sustainable development and sustainable architecture which is followed. Without doubt, unsustainable consumption of nonrenewable natural resources like fossil fuels, the Environment will be at risk in the near future. While, the building sector accounts more than a third of energy. Therefore reduce the amount of energy in Buildings causes toward sustainable development which consistent with the needs of today's generation which put future generation at risk. One of the painters of sustainability in architecture is the use of natural energy and fossil energy consumption and minimum natural environmental conditions and climate so solar building designs which is a step towards its achieving .In this article , has been expressed the important factors in solar buildings design . These factors are included external factors and internal factors. More owner implementation strategies in the design to same energy in buildings also will be presented.
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1 - Introduction

Vernacular architecture around the world has been shaped by the natural environment today and it is forgotten, Consistent with the present climate. Withdrawal from traditional architecture and increased consumption of fossil fuels pollute the environment has been increasing waste of energy resources, Due to the flexible nature of the resource is necessary to pay attention to the scientific use of natural renewable energy and Looking for new projects, especially in our building. Given that one of the goals of sustainable architecture heating and cooling needs by renewable energy With the move to solar building design are taking an important step towards sustainable development And take away from dependence on fossil fuels In this paper, we examine the cognitive energy and solar energy in buildings.

2 - Materials and Methods

In this paper is a descriptive and analytical method. Tools for data collection is library research, internet and field research and General pattern of the research process is based on material extracted from the literature and experience. After study predicted, Results will be analyzed and tried to use the processing and analysis of data and findings in the field of Library Studies, to achieve results in terms of proposals for better use of solar energy in buildings.

3 - Define the energy

Energy is the ability to do the job. This means you need to spend some energy to do something. A division can be divided into two groups, 1- energy - renewable energy – 2- non-renewable energy.

Non-renewable energy is the energies of millions of years to come, and they have limited resources and Have much time to produce and Ends. Such as (Crude Oil - Gas - Coal - all fossil energy)

Renewable energy is energy that exists in nature. They have limited resources and do not pollute the environment and such as (wind, solar energy - biomass - Geothermal - energy, water, etc.)

4 - Definition of solar energy

All forms of energy almost come from the land of the sun. Solar energy is another important addition to the advantage of renewable. This is a great environmentally friendly energy. On average, the sun emits energy in kWh per second 10 × 1.1. Earth's surface is only about 47% of the total energy emitted by the sun, Per second, roughly 10 × 1/1 kWh of energy is emitted from the sun that hits the earth's atmosphere to the outer surface of a two-billionth of the energy.

5 - Solar Cells

Solar cells are devices that convert solar energy directly into electricity or Photovoltaic solar energy is converted directly or indirectly through the effects of heat or chemical energy. Solar cells are divided into three categories: 1 - single-crystalline silicon cells 2 - Multi-crystalline silicon cells - 3 cells, amorphous silicon.

Table (1): The percentage of solar systems

Materials	% Efficiency in production	% Efficiency in the lab
Single-crystal silicon	14 to 17	24 about
Polycrystalline silicon	13 to 15	18 about
Amorphous silicon	5 to 7	13 about

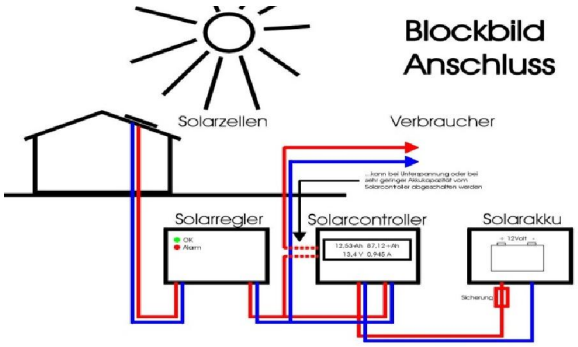


Figure (1) solar cell

6 - Photovoltaic Cells

Solar cells, also called photovoltaic cells, which sometimes refers to them, The scales are made of photovoltaic cells and solar cells That convert light directly into electricity. Photovoltaic systems can work in any weather.

This system is used for three general objectives: 1 - optimize utilization of solar energy -2- energy saving high efficiency -3- Efficient use of energy

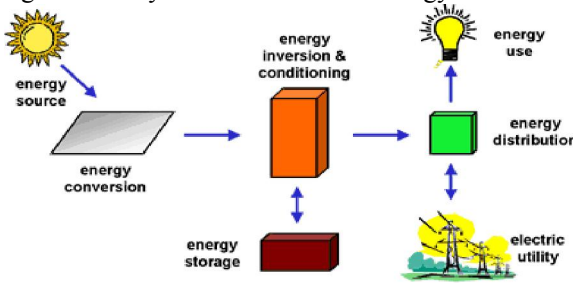


Figure (2): Photovoltaic system components

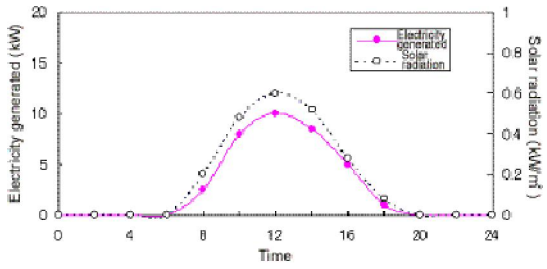
7 - The energy situation in the world and Iran

. About 66 percent of total commercial energy in the world's energy and 80 percent of the world's electricity comes from fossil fuels, which is to include: Heating - Transport - Electricity - production and consumption. In Asia, 42% of the energy used comes from fossil fuels and World energy consumption is now equal to 7/9 million tons of oil and during the past two decades has been the growth of 1 to 3 percent per year.

Iran is one of the top 15 countries in terms of fuel consumption And the Petroleum Exporting Countries is the largest consumer of food Considering the top 5 percent of consumption growth can be seen easily be doubled every 10 years our energy. Major sources of energy that are used currently in Iran's crude oil - natural gas - coal - water potential - non-commercial energy, etc.

8 - Solar radiation

Sun has introduced itself as a giant nuclear reactor melt down of the solar radiation is a major source of energy Human civilizations have been trying to have the radiation used to provide maximum comfort to the living conditions. Solar radiation can be divided into two categories: 1 -direct radiation -2 radiations scattered



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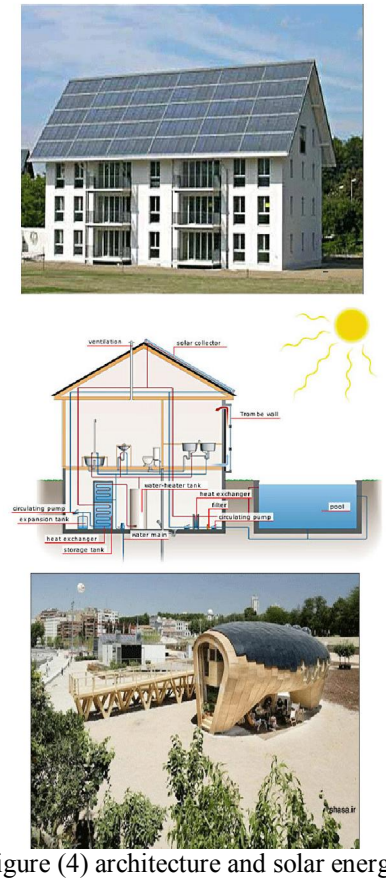

Figure (4) architecture and solar energy

9-1 - direct receive:

The most common system is called passive solar direct gain. Business is directly related to the sun to enter the building from the windows and heats the interior of the home. During daylight hours, the heat stored in the thermal mass of interior walls, ceilings or water material - stone - concrete and brick. A home comfort system is the solar collector absorber and heat distribution system. South side glass solar heat absorber and distribution systems. Solar energy can be directed into the south side where the thermal mass, such as the walls and floor of the light irradiated directly and indirectly.

Analysis of a solar heat storage that is used to conduct heat into the home:

1 - The thickness of the thermal mass of the building to exceed the 24/15 cm.

2 - floors are used as thermal mass should be completely covered by carpets throughout.

3 - Use dark colors for floors.

4 - For every 90 meters south, Glass 9/67 kilometers

The walls and floors are in direct business operations of the thermal mass of the house and Can be used to heat water storage tanks can be difficult if the use of water tanks on the map.

9-2 - business indirectly:

In an indirect solar radiation that reaches the atmosphere is absorbed by the thermal mass and solar home and it is transmitted by conduction to the home. Indirect acquisition system can use up to 30 -45% of the solar energy that reaches the glass as thermal mass and The system can be cited to explain the performance of a pool.

So solar heating system should always be considered together by the interaction of four interrelated:

Transparent thermal insulation: It can be heat formed glass work and make sunlight into the building.

2 - Absorber, which can be selected by one of the black sun is absorbed and converted into thermal energy

3 - Factors storage: thermal energy by building components and then spread apart as the radiant heat inside

4 - Protection against overheating: If the excess energy can be prevented with a solar heating system too.

General rules acquisition system for walls Trombe indirectly:

1- Minimum distance of 1 meter between glass and thermal mass walls
2- The Wall is a dark mass of the sun.
3- Valves that are used in the thermal mass of the wall should be closed at night.

Water is stored in flat roof 3 to 15 m. The cooling system is best for areas with low humidity but for wet areas should be placed in a large plastic or fiberglass tanks covered by the glass is heated by radiation under space.

10 - Ways of taking advantage of solar energy

More ways to utilize solar energy in buildings:

POSITION building

It is very effective, appropriate sun, the landscape and the location of the building site. So you should be able to get the winter sun from 9 am to 3 pm. The amount of hours will get 90% of the solar energy that is building to the north pitch and to avoid the obstacles that prevent the radiation of the sun.

Form and orientation building

Building volume should be able to absorb sunlight penetration. Building design of the building and the solar radiation is thought to enhance the volume and tone building east-west direction. The form factor and overall the climate is best, but for some of the region's better this way.

A - Cold or hot climates better compression because it is a form of low-level exposure to the harsh environment of the B - The mild climate is more freedom.

C - Hot and humid climate, it is better east-west elongated form. (Ahmadi, 1387).

Layout of spaces to take advantage of solar heat

This temperature can be achieved in different ways. For example, the use of materials with high thermal capacity and maintenance is effective for absorbing heat in the walls or covering large areas with large windows on the south side of heat the sun to receive highest at optimum temperature control achieved by the strategies used and the layout. For example, the eastern facades of buildings with large windows make the heat acquired during the morning rise and prevent ghosting on the Western Front during the afternoon heat gain. (Shafii, 1387)

Layout of spaces to take advantage of more natural light.

Use natural lighting instead of electric lights can reduce the electrical energy consumption of the building. Windows and roof and floor openings and wall of windows, natural light is directed toward a device can directly or indirectly into the building. For example, North and South, with the best quality of light and the light from the West is boring. (Shafii, 1387)

The combination of internal spaces

Interior spaces should be combined so that the space in terms of importance, to obtain maximum solar energy. Therefore we need to put the answer in front of the main areas of southern. It is building necessary to respond to the southeast and southwest areas. The North must be patterns that require less light to areas Such as hallways and garages. You will receive a

much light in the east and west facades. Could use the window onto the roof, or if not possible, use a light south because building poor form (Vaziri, 1390)
Window
As one of the most influential factors in the design of climate. Type and size and location of windows will have a significant impact on the heat acquired Sun. The choice of the type of glass and profiles with today's advanced technology in the long run lowers the cost of energy is consumed by buildings. (Shafii, 1387)
Ways of preventing heat loss in buildings
The following are ways to prevent heat loss in buildings
Direction establishment of building
Direction establishment building, in addition to the impact on energy consumption of the building heating and cooling loads. In general, the main aspects of organizing large of building north and south direction, is greatly beneficial in reducing the burden of insulation and ventilation rate. Further investigation revealed that the extra time and energy consumption Direction air conditioning establishment of building - Eastern South Western - still rises in the northern wall of the window to increase. Sometimes it may not coincide with the geographical location of building site for solar orientation. In these cases, to improve the climate, can be designed to match or parking ground floor of some building components such as the geographical location of the site If you plan to be in classes which are tip top shape Direction minimal insulation windows generally north - south in the tropics, Otherwise, you can plan on of building orientation for solar design. Should be reduced as much as possible, walls of windows in the east - west. (Chirography, 1387)
Below are some of the best practical solution to achieve an optimal design, website design and optimization of building energy consumption:

- South would have Direction be one of the features of building is at least 25 degrees Direction the south of the maximum acceptable deviation
- It stretches east-west of building has to be a proper Southern Weekly
- In a housing project in either tall and short buildings, it is located at the north entrance of the building there is the need for canopy
- North side of the building should be as close as possible to the ground. The distance from the front of the building and thus much less likely to be shading the building
- Small land and land that are irregularly shaped, regardless of the congestion problem, would be problematic in terms of building orientation
- Should be avoided as much as possible from the design of tall buildings and narrow streets and sidewalks in areas that are north-south axis.
- Design the parallel street, and the east-west axis is more appropriate. Because it provides a possible orientation of buildings to the south.

The functional arrangement of internal spaces should consider the following points:

- Long-term performance spaces such as living room, kitchen, dining room and etc. Requiring more interior temperature, so it should be located on the south side of the building
- Short-term performance spaces such as rooms and bathrooms need to lower the temperature should be in place by mid-temperature.
- Auxiliary spaces (warehouses and garages) on the northern side should be used to act as a buffer space between the inside and the outside of the building space heating
- Rooms to sleep because of the noise must not be located in a side street overlooking the street (Shahbazi, 1390)

11 – Conclusion

One of the key principles used in developing stable sources of renewable energy technology. There are three main reasons for this: These resources are far fewer environmental impacts than other energy sources, there is a lot to choose which utilize renewable energy, and particularly solar energy offers a much cleaner system that can replace the current energy system is largely. The solar system is a long term investment that will bring a lifetime of work, saving money and energy in abundance, If it is feasible to use solar energy in the country's culture will be followed for the annual figure of about 1310 × 64/1 rial saving fossil fuel and electricity consumption.

12 – Suggestions

The following factors cause the low thermal dissipation and maximum utilization of solar energy in architectural design.
1. Material forming the outer shell of the building should be the highest heat resistance. Among them we can mention the lightweight concrete, foam concrete, gas concrete, and concrete without fine grain.
2. Should reduce the exterior shell surface area to volume ratio of useful and helpful to the roof of the building and the pop of the outer shell (on windows) good level building.
3. Need to reduce air leakage from the seams and openings slough noted.
4. Summer planting trees in the West and South West beneficial effect in reducing the heat to the building.

5. 5. Deciduous trees are good devices and they can be planted in the south of the building, as are leafy in spring and summer And reduce the amount of incoming radiation and the buildings are no leaves in the winter and do not prevent sunlight reaching.
6. Living spaces are designed more to be used, overlooking the South
7. Should be designed reflecting surfaces of floors and windows overlooking the sun-porch and attached greenhouse space
8. Walls are made of heavy materials in view of the southern
9. Appropriate thermal insulation material to be considered dependent thermal resistance.
10. Increase the productivity of natural light and reduce electric energy consumption
11. Approximate area of windows for daylight to be 5 percent of the total floor area
12. Placement of windows on the south side of the building
13. Canopy which is used to reduce the energy spent to cool buildings in summer

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