

Review Paper on optimization of household energy budget and payback period

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ABSTRACT

There is various techniques that result in energy savings in a building or house, each having a special cost of function and different cost. Our main aim with Linear Programming methodology is to conclude the budget. Actions are taken in the problem statement that is used to save the maximum energy of the household or resident. In this objective problem is of power saving and budget estimation. Here we are using different material as the constraints function for the different value of savings of energy. Linear programming is used here in calculations to install photovoltaic solar cell and solar panels, changing normal windows having double glazed window. We are also changing normal incandescent bulbs to fluorescent light bulbs; also changing the quality of appliances i.e. C class appliances is changed with A class. When we are doing this then by the appropriate method which we are using we can see that replacing with double glazed window and triple glazed window and normal CFL bulbs are the effective choice for low budget. In the output we are getting maximum savings of energy in the household building or we can also use it for commercial purpose.

Key Words: Energy security, Linear Programming, Double gazed window, Triple gazed window.

INTRODUCTION

The planning of an Eco city has multiple functions. It includes consumption of energy by the building, carbon emission by the environment. Optimization studies have been conducted in building science in recent years after long being computationally intractable. In the field of building science, the systems of interest are extremely complex; with a high number of variables, non-linear equations, and simulation durations often as large as one year, such systems is a difficult task. This also involves the cost on the initial basis and also the implementation cost.

As the current scenario is according to that it is very important that we use energy where we require and optimization is very important. By this we can support to healthy life and strong economy for today and future as well. By the efficient use of energy we can also decrease environmental pollution by doing these methods we can give supportive hand to development of country and for pollution as well. As we know that building have very great effect as the consumption of building is very high and it is approximately 45% in all the form of energy. It is in the commercial form where that amount of energy is given in the form of processed form. Then this processed fuel is converted to electricity form which is used in the development of a country [1,2]. To complement efficiency standards, this study illustrates how energy efficiency can be improved through such initiatives as efficiency labeling or certification, very best practice buildings with extremely low or no-energy consumption and other policies to raise buildings' energy efficiency beyond minimum requirements.

HOUSEHOLD ENERGY EFFICIENT METHOD: ISSUES

Energy security is very important for many commercial, industry and government sectors. During the last years we have become more aware of the need to save energy by using more energy efficient equipment's, but the need for energy will still increase in the nearest future. Today two billion out of about six billion people have no access to electricity in their homes [3,4]. It is urgent to improve this, and it can only be achieved by energy efficient method. A method which reduces risks that comes from energy use. Energy security is basically defined on the term that how we can supply reliable and effective energy so that it can play an important role in the economy of country and national growth at reasonable price [5]. However, few issues are addressed that are needed to be resolved while planning this method. Some of the issues are given below [6]:

- A. To reduce the difference between energy requirement and supply,
- B. To improve efficiency of energy and securing by low to energy and its intensity,
- C. To achieve the optimum energy combination
- D. To Diversify sources of energy and also its supply
- E. To investigate in energy manufacture and its development
- F. To shift and use the alternate and renewable methods of energy

OBJECTIVES

The objectives of the research are:

- 1) To study the basic need of energy: To study the optimization techniques for energy saving
- 2) To understand the energy conservation methods in buildings various methods and algorithm to calculate and maximize the energy savings. To analyze and comparison for the different methods by which energy saving is being maximized.

HOUSEHOLD ENERGY CONSERVATION METHOD

To promote energy efficiency for residential buildings, a research has been conducted to investigate the characteristics of energy consumption in the residential buildings and develop a suitable energy labeling system for assessing the building energy performance. The aims of the research are to review worldwide experience, study the feasibility of establishing building energy labels, and evaluate the key factors for design and implementation of the building energy labels. In one of them system is labeling system. Energy efficiency label is very important as that gives information of the product. Product has information like date of manufacture, content, rating, energy consumption, power consumption, current rating, voltage rating, revolution per second, number of turns and many more these all are written on the label. These labeling are very important to the consumer so that he can purchase product according to the requirement. Energy star is also a program used for labeling.

The materials used for the optimization and techniques used to improve the energy efficiency is different for different one and varies in many sense of parameters. Jaber and Ajib represented the main terms to achieve and acquire the conservation of energy in industrial and residential sectors:

- a) Design for considering climate effects. To decrease heat, cooling, sparking, appliances and water loads generally it is hot water.
- b) To enhance the quality of equipment of the house. Equipment may be mechanical or electrical or both.
- c) Replacing waste to renewable sources that is used for the primary energy.

Two systems spend a good amount of currency in the household expenditure. The decrease in heating load due to excess electric lighting is smaller than the excess lighting energy load leading to higher cooling loads and thus to higher total energy load. This effect has also been observed by Bourgeois et al. [5].

As we know in the building there are two types of systems:

Heat system and cold system

Heat systems are of many types as boilers, heat pipes, heater and cooling machines, air conditioner. As we know that air conditioner is very expensive and its installation cost is very high as well. Energy requirement for the building is done by using much transformation and energy requirement cannot meet by using these type of expensive appliances. So we will use equipment according to energy requirement of the building.

Window glazing techniques used to optimize the energy savings of a building. We assume that the construction of building or house is as per the norms of civil engineering and related authorities. In order to achieve this goal, house owner and flat owner must take suitable actions to reduce their energy consumption without compromising from their standard of living. The energy conservation methods involved in this research were installing the SolarPanel at roof, replacing normal Single glazed windows with Double glazed windows ones, then with Triple glazed windows ones [6,7].

HOW DO DOUBLE GLAZED WINDOWS WORKS?

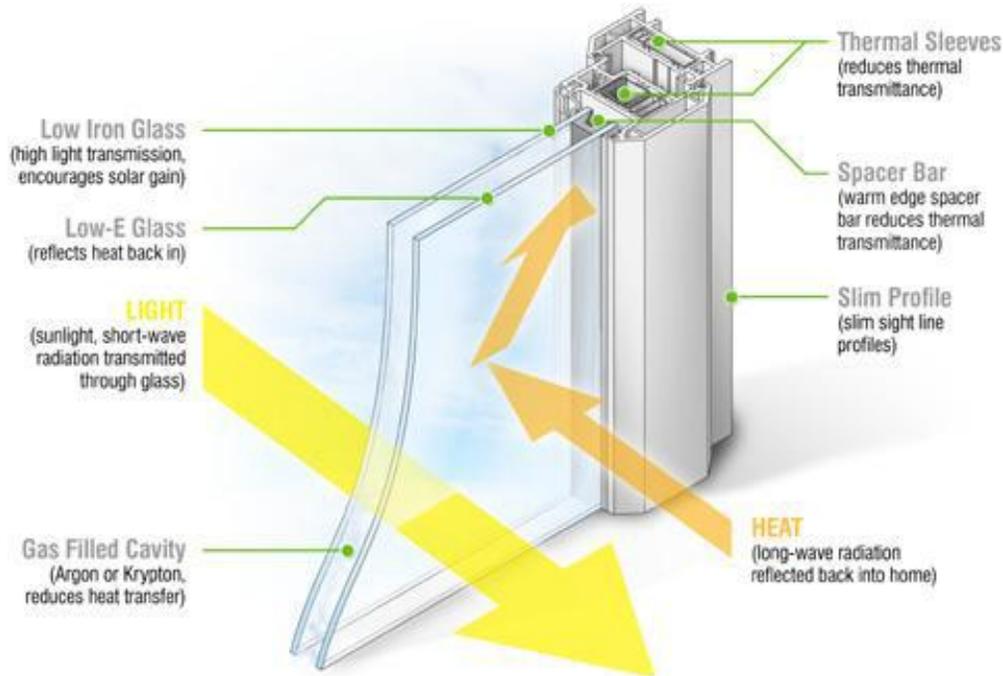


Fig. 1: Double glazed window (working)

TRIPLE GLAZED WINDOW

Triple glazed window in which there are three glasses and having two separations in which inert gas like argon is filled, we used triple glazed window because due to two separations there is very less heat and thermal energy transferred from outer climate to inner or desire done. As we are moving towards next section we can see that many other energy savings factors and theories are which work on the optimization techniques. For that location of resident and climate condition of place also matters a lot.

To overcome these demerits we can use 'Triple Glazed Window'. In the triple glazed window [8] three glass panes are separated by one another. The distance between the glasses is as according to the area or width of window socket. The distance between each glass panes reduces the heat loss so in the triple glazed window the separation is filled by the inert gas or by the argon gas which is good insulator of heat. So in that case more heat loss can be saved and we can minimize more energy and can save more energy. This is a good approach for saving energy and this strategy is called as the envelope of building. Use of double glazed window is good but it is not the effective way because the cost of double or triple glazed window is comparatively high than normal window.

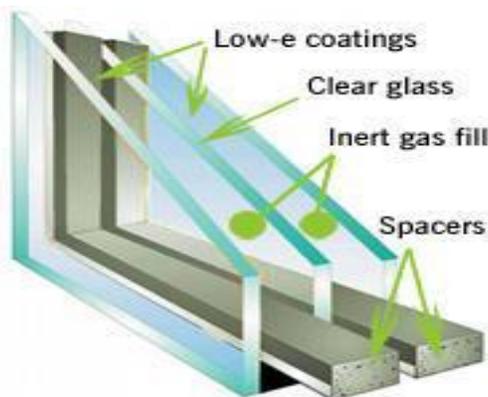


Fig. 2: Triple glazed window (structure)

These windows offer 28% - 30% (approx.) more insulation than double-glazed window. It also decreases thermal transfer by 75% - 80% making it the most energy-efficient option around. It also mitigates noise. Therefore triple-glazed windows perform all the functions of double-glazed windows, but with more effectiveness. They are just marginally more expensive [9,10].

CONCLUSION

We discussed various material technology in this review work to maximize the energy savings according to the budget and household. The residential building which we have taken is two floored building. This method involved to reduce the energy consumption of building. For this purpose we install photo voltaic solar plates, used double glaze window and changes low class appliances to the high class. In these appliances we have taken refrigerator, dishwasher and washing machine. There are many methods to optimize the energy. When we are changing or replacing the appliances then it does not come as good option. When we install solar panel energy savings goes on high value. So installing solar panel is good option. We have profit of each year which works on the long term goal. By the calculation we calculated payback period. So in this project we have worked on many cases according to the requirement of user or customer. Purchasing of double glaze window, triple glaze window and replacing normal bulb to CFL is optimum choice. As they have low cost related to other techniques. This project can be modified in the case if we take another building or for other climate condition. By this method we can optimize the data globally or according to user's demand and requirement.

REFERENCES

- [1] J. Laustsen, Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings, IEA Information Paper, *International Energy Agency*, Paris,2008.
- [2] L. Perez-Lombard, J. Ortiz, C. Pout, A review on buildings energy consumption information, *Energy and Buildings* 40 (2008)394–398.
- [3] B. Hunn, Fundamental of building energy dynamics, in: Massachusetts, Institute of Technology, London, England, 1996.
- [4] R.K. Dixon, E. McGowan, G. Onysko, R.M. Scheer, U.S. energy conservation and efficiency policies: challenges and opportunities, *Energy Policy* 38 (2010)6398–6408.
- [5] N. Hamza, D. Greenwood, Energy conservation regulations: impacts on design and procurement of low energy buildings, *Building and Environment* 44(2009)929–936.
- [6] W.L. Lee, F.W.H. Yik, Regulatory and voluntary approaches for enhancing building energy efficiency, *Progress in Energy and Combustion Science* 30(2004)477–499.
- [7] P. Ekins, E. Lees, The impact of EU policies on energy use in and the evolution of the UK built environment, *Energy Policy* 36(2008)4580–4583.
- [8] S. Wiel, C. Egan, M.D. Cava, Energy efficiency standards and labels provide a solid foundation for economic growth, climate change mitigation, and regional trade, *Energy Sustainable and Development* 10 (2006)54–63.
- [9] M. Balat, Security of energy supply in Turkey: challenges and solutions, *Energy Conversion Management* 51 (2010)1998–2011.
- [10] J.A. Wright, H.A. Loosemore, R. Farmani, Optimization of building thermal design and control by multi-criterion genetic algorithm, *Energy and Buildings* 34 (2012)959–972.