

# Applications of Solar Energy in India

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## ABSTRACT

In today's climate of growing energy needs and increasing environmental concern, alternatives to the use of polluting fossil fuels have to be investigated. India is one of the few countries in the world that has a dedicated ministry for New and Renewable energy. Of all the energy sources available, solar has perhaps the most guarantees. Solar energy is created by light and heat which is emitted by the sun in the form of electromagnetic radiation. With today's technology, we are able to capture this radiation and renovate it into usable forms of energy - such as heat or electricity. Humans can rely on solar energy to survive, including all other forms of renewable energy. It is observed that the total amount of solar energy resources is multi times of the energy used by humans. The purpose of this paper is to review the applications of solar energy in India. Solar energy is here to stay and will become the primary source of energy when researchers develop a way to harness it and store it for later use.

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## I. INTRODUCTION

The sun is responsible for all of the energy on the earth. Plants use the sun's light to make food. Decomposing plants millions of years ago produced the coal, oil and natural gas that we use today. Solar energy is most commonly collected by using solar units. By simply having well placed windows, one can use solar energy to heat up and light up a building. One can also use solar energy to dry our clothes in the sunlight. To use solar energy to power electrical appliances solar cells are used. The renewable energy source is the best choice for India. One should attempt to develop the application of solar farm in India.

### 1. Basic Principle

Solar energy is created by light and heat which is emitted

by the sun, in the form of electromagnetic radiation. With today's technology, we are able to capture this radiation and convert it into usable forms of energy - such as heat or electricity. Solar energy is the sun's nuclear fusion reactions by which the continuous energy gets generated. The average solar radiation intensity is 1367kw/m<sup>2</sup> for the earth's orbit.[1] The major problem of development and utilization of solar energy is due to the low density of the solar energy and it is influenced by location and season.

## II. APPLICATIONS

Few important applications of solar energy are discussed bellow

#### **a. Solar Water Heater**

Solar water heaters include storage tanks and solar collectors. In order to use a solar water heater storage tank must be well-insulated. These storage tanks have an inlet and outlet connected to the collector. Solar water heating systems may be either active or passive systems. The most common is active system; rely on pump to move the liquid between the collector and the storage tank. The passive systems rely on gravity and the tendency for water to naturally circulate as it is heated.[2] A few industrial application of solar water heaters are listed below like Hotels, Dairies, Textiles, Breweries & Distilleries, etc.

#### **b. Solar Pool Heating**

In a solar swimming pool heater, one can reduce swimming pool heating costs drastically, by simply installing a solar pool heater. It makes sense because one should be able to enjoy the pool longer and throughout the year. Solar swimming pool heaters are cost competitive with others like gas and heat pump pool heaters.[3]

#### **c. Solar Electricity**

Solar electricity is a wonder of science that can really help human in many ways. It is cost effective and lean a common man away from the big guns who try to monopolize the industry. To have solar electricity, one needs a solar photovoltaic (PV) system. This kind of system is not only reliable but pollution-free also. Because of the increasing demand for this type of system, the costs of purchasing and installing systems are becoming cheaper. PV technology uses both direct and scattered sunlight to produce electricity. This means that the direct sunlight is absorbed by the system. Solar PV systems have following applications like Telecommunications, Battery chargers, Lighting, Water Pumping, etc.

#### **d. Water Purification**

The simplest solar water purification system around is the solar box and solar still. Solar boxes have been used for a long time in cooking food and can also be used to purify water. In order to kill bacteria, boiling water is not the only method that needs to be used. This method only kills pathogens. The water needs to be pasteurized in order to kill off disease causing bacteria.

#### **e. Solar Cooking**

Up till now, people have used a certain type of fuel to ignite a flame so as to cook the food they wanted on a cooker. The problem with these cookers is that often they would cook the food unevenly, or would burn the food. Cooking food using the sun's rays makes cooking easier. You are not required to use fuel to ignite a flame. Instead, the sun's rays are converted to heat so as to cook the food that is placed on a rack or grill. There are different types of solar cookers. Some of them are slow cookers while others reach higher temperatures so as to fry the foods. Slow cooking is better because slow cooking retains flavor, moisture, nutrients, and makes meats tendered.[4,5,6]

#### **f. Solar Cooling**

Solar cooling systems work by using thermal energy that is collected from the solar collector, and uses this to separate a mixture of the energy and the refrigerant fluid. The refrigerant is condensed, throttled, and evaporated to produce a cooling effect, after which it is re-absorbed back into the system to complete the work the system had intended.[7]

#### **g. Solar Drier**

Solar driers can be divided into two categories:

- a. Driers in which the sunlight is directly employed; warmth absorption occurs here primarily by the product itself. These are further divisible into three sorts like, traditional drying racks in the open air, covered racks (protecting against dust and insects) and drying boxes provided with insulation and absorptive material
- b. Driers in which the sunlight is employed indirectly. In this method, the drying air is warmed in a space other than that where the product is stacked. The products, then, are not exposed to direct sunlight. Various sorts of construction are possible; this design can also be provided with powered fans in order to optimise the air circulation.

#### **h. Solar Distillation**

The simplest application of a thermal solar energy installation is in the distillation of water. The solar distiller purifies water by first evaporating and then condensing it. Distilled water contains no salts, minerals or organic impurities. It is not, however,

aseptic, as is sterilized water; of which more lately. Distilled water can be used for: drinking water, applications in hospitals, battery water, and so on.[8]

### III. LIMITATIONS

Whenever one is convinced that new solar technologies should be used by rural people, one should start by appreciating their own experience, looking at how they use their own resources and then find out together whether the new technology could be of any use to them and how it could be introduced. An important part of this process is a discussion of not only the advantages but also the limitations of the new technology.

The source of energy, solar radiation, is free, but the equipment needed to persuade the solar rays to do useful work can sometimes be expensive, usually requires maintenance and needs certain understanding of how things work.

It is a pity that there are so many examples in developing countries of solar energy equipment which has been 'dumped' into villages, without even asking if it could be of any use to the inhabitants. The ability of rural people to recognize immediately the benefits of a new technology, and to rapidly absorb it, is often underestimated. The first step for the introduction of any new technology should be the needs of the people for which it is aimed, and usually they know their needs much better than we do.

### REFERENCES

- [1] V. Jose Ananth Vino, "Increase Of Solar Efficiency Through Heat Dissipation", International Journal of Computer Trends and Technology (IJCTT) – volume 3 Issue 6 Number 1 – Nov 2012.
- [2] Y. Demirel, Energy, Green Energy and Technology, DOI: 10.1007/978-1-4471-2372-9\_2, Springer-Verlag London Limited 2012.
- [3] Solar Water and Pool Heating Manual Design and Installation & Repair and maintenance Florida Solar Energy Center Cocoa, Florida <http://www.fsec.ucf.edu> fsec-in-24 January 2006.

- [4] Abhishek Saxena, Varun, S.P. Pandey, G. Srivastav, (2011), A Thermodynamic Review On Solar Box Type Cookers, Renewable And Sustainable Energy Reviews, Volume 15, Issue 6, August 2011, Pages 3301–3318.
- [5] Binark and Turkmen, 1996, A.K. Binark, N. Turkmen, Modelling Of A Hot Box Solar Cooker, Energy Conversion And Management, 37 (1996), pp. 303–310.
- [6] Ekechukwu and Ugwuoke, (2003), O.V. Ekechukwu, N.T. Ugwuoke, Design And Measured Performance Of A Plane Reflector Augmented Box-Type Solar-Energy Cooker, Renewable Energy, 28 (2003), pp. 1935–1952.
- [7] S Srinivasa Murthy, "Solar Cooling Technologies", India - Spain Workshop on Renewable Energies Sevilla (Spain) March, 1-4 2011.  
Alpesh Mehta, Arjun Vyas, Nitin Bodar, Dharmesh Lathiya, "Design of Solar Distillation System", International Journal of Advanced Science and Technology Vol. 29, April 2011.