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A Review on Application of PV/T on Domestic Water Heating

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Abstract: The Type Energies being strategic commodities plays a significant role in economic development of a country. Energy systems in India have evolved over last six decades along with country's economic development, supporting the aspiration of 1.2 billion people, within the framework of democratic polity, globally integrated economy and environmentally sensitive regime. India pursued a reformed development agenda for solar system since 1991. Significant effort has gone into improving energy availability, as support to country's development initiatives. The present works propose application of solar energy for generation of heat energy and electricity.

Keywords: Solar energy; Cooling; PV Model; Overall Performance

I. INTRODUCTION

The word "energy" started figuring prominently in the news and printing media after the first oil shock of 1973. Since then the words energy crises & energy security continually dominate the news. Shortage in the oil supply consequently increases the prices. It is by now clear that the fossil fuel area of non-renewable resources is gradually coming to end; oil will be first to depleted, followed by natural gas & coal [20]. India is facing large energy issue. Day by day import of crude oil increases rapidly which becomes dominant in all other expenditure. The need to study and investigate existing & developing energy alternatives are becomes necessary. Considerable research and development work is already in progress in that direction.

One of the most promising options is to make more extensive use of renewable sources of energy derived from sun. Solar energy is the most abundant and promising energy resources existing on earth the sun, our singular source of renewable energy, sits at the Centre of the solar system and emits energy as electromagnetic radiation at an extremely large scale and relatively constant rate, all days of the year. The one basic resource for all solar energy systems is the sun. For design of any solar energy system the knowledge of availability of solar energy is important.

Solar radiation may be used to generate electricity directly via photovoltaic systems, but with a price tag which is still substantially higher than for electricity from conventional fossil and nuclear power plants. Significantly less expensive is the thermal use of solar radiation for heating of water and buildings, for provision of process heat for industrial operations and even as energy input for solar thermal power plants. It is, therefore, not surprising that this form of energy has already been used widely.

The major application is the use of solar heat for domestic and industrial water and space heating. However, there are further applications above this relatively low temperature level. The industrial heat demand in Europe for processes such as food, chemicals, petrochemicals, minerals, etc. has been estimated to 300 TWh/year for the temperature range up to 250°C, i.e. to about 8% of the total European end-energy consumption. This huge potential has, so far, hardly been considered at all for solar applications, even though this temperature range can be realized with advanced solar thermal collector technologies.

II. LITERATURE SURVEY

During the study to build an integrated PV/T water collector system 37W polycrystalline PV module is used. for evaluation of the energy gain of the PV/T collector the concept of energy saving efficiency has been used by Pratish Rawat et.al[1]. During the test he found energy saving efficiency of a hybrid PV/T system is larger than the efficiency of conventional solar water heating system i.e 0.68. He founds that the overall efficiency of PV/T system including electrical and thermal conversion is 57.61 % which is affected by various parameter which are Mass flow rate, inlet water temperature & outlet water temperature, intensity of solar radiation, ambient temperature, wind speed, orientation of system. The analytical and exergetic performance assessment of a PV/T hybrid collector was carried out by Farkas et.al. [2].The problem of overheating of the PV panel system was tackled by using hybrid PV/T collector system. Glass covered PV/T Collector has the highest exergy efficiency compared to the different type of hybrid PV/T collector. During the assessment they found that if the temperature of PV reduced by 10^0 then it causes one percent increase in efficiency. Increase in ambient temperature due to the increase in solar irradiation the cell of PV panel become less efficient, to

stabilise them in at operating temperature by the cooling of the cell which is concluded by Khalifa et.al.[3] in the study of energetic study of hybrid solar PVT collector. During the study he stated that there is reduction in the initial cost by considering the idea of the combination of the collector, Since the reproduction of many thermal elements such as Reinforcement, covers & insulation which are common in PV panel are not required. In this paper, electrical and thermal efficiency of the hybrid photovoltaic/thermal collector (PV/T) system was examined by Dilsad Engin et.al.[4] stating a mathematical model and developing a prototype of the system. The performance of the system is tested under natural flow condition and the forced flow condition. The performance of themal collector is different for different type of circulation mode i.e for natural circulation thermal efficecy was 41% and whereas efficiency was 58.7% during forced circulation with a pump. The PV/T hybrid system's instantaneous efficiency under natural ow conditions was found to be 71%. The performance of themal collector is different for different type of circulation mode i.e for natural circulation thermal efficecy was 41% and whereas efficiency was 58.7% during forced circulation with a pump. The comparative study of the different two cases of PV panel[case A (collectors partially covered by PV modules; 30% PV) and case B (collectors fully covered by PV modules)] studied by R.K. Mishra et.al.[5] in five different cities in four weather conditions. The analysis is based on thermal energy, exergy and electrical energy .The total annual gain is maximum for the Jodhpur city and minimum for the Srinagar city. The percentage difference between Srinagar and Jodhpur and is 23.4% and 25% for case A and case B, respectively. The annual gain for New Delhi, Mumbai, and Bangalore is nearly the same. The percentage variation between the three cities and Srinagar is 12%, 15.2%, and 10.4% for case A and 10.2%, 14%, and 9.3% for case B, respectively. In the paper of potential of applying hybrid solar technology in Hong Kong, T.T. Chow et.al.[6] investigate a centralised water based collector system serving as solar assisted domestic hot water system of a hypothetical high rise apartment building. The experiment carried out by using two groups of amorphous Silicon hybrid collector which were mounted on two different vertical walls that are rich in all year-round solar radiation. The TRNSYS simulator platform was used to predict the energy performance numerically. The thermal efficiency was found to be 33.6% and electrical efficiency 4.6% with the proposed design and operating conditions based on a-Si hybrid collector area 3.75m^2.

III. CONCLUSION

Various authors have carried out the detailed study on improvement on heat trasfer in photovolaic panels. It has been seen that as the temperature of the PV panel increses the overall efficiency of the system decreses. As there are mostly two types of colling systems i.e Air based and Water based colling system. The overheating of PV panel can be minimized more effectively by the use of water based Hybrid PV/T system, further which enhances the overall performance of system and which can be used for domestic water heating apllications.

REFERENCES

[1] Pratish Rawat, Mary Debbarma, Saurabh Mehrotra and K. Sudhakar, design, development and experimental investigation of solar photovoltaic/thermal (pv/t) water collector system [1].
[2] I. Farkas1* and I. Kocsany2 and I. Seres, Exergy based performance analysis of hybrid solar collectors [2].
[3] A. Khelifa 1*, K. Touafek 1 and H. Benmoussa, Energetic study of hybrid solar PV/T collectors, Revue des Energies Renouvelables Vol. 16 N°4 (2013) 619 – 628[3].
[4] Dilsad ENG, Metin COLAK , Modeling and performance optimization of photovoltaic and thermal collector hybrid system, Turkish Journal of Electrical Engineering & Computer Sciences.[4].
[5] R. K. Mishra and Arvind Tiwari, Study of Hybrid Photovoltaic Thermal (HPVT) Solar Water Heater at Constant Collection Temperature for Indian Climatic Conditions, Ashdin Publishing Journal of Fundamentals of Renewable Energy and Applications Vol. 2 (2012), Article ID R120310, 4 pages[5]
[6] T.T.Chow, K.L.S.CHAN, S.K.F.FONG,Potential of applying hybrid solar technology in Hong kong[6].
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