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SOLAR POND AND ITS APPLICATIONS

Sagar Dhole[1], Prajwal Munde[2], Tushar Gawande[3]
[1]*U.G Student, Mechanical, J.D.I.E.T , Maharashtra, India,* ***sagardhl786@gmail.com***
[2]*U.G Student, Mechanical, J.D.I.E.T , Maharashtra, India,* ***prajwalmunde001@gmail.com***
[3]*U.G Student, Mechanical, J.D.I.E.T , Maharashtra, India,* ***tushargawande350@gmail.com***

Abstract
Solar pond was discovered as a natural phenomena around the turn of the last century in the medev lakein Transylvania in Hungary. In this lake, temperatures up to 70 ◦C were recorded at a depth of 1.32 m at the end of the summer season. Minimal temperature was 26 ◦C during early spring. The bottom of this lake had a salt NaCl with concentration of 26 percent. Solar pond is artificially constructed. To prevent convection, salt water is used in the pond. Those ponds are called "salt gradient solar pond". Nowadays, mini solar ponds are also being constructed for various thermal applications. It was concluded that the optimum value of salinity in the mini solar pond is 80 g/kg of water. It is an ecofriendly way of generating electricity. The waste and impure water is used as input . By the help of Rankine cycle process a turbine is connected to the inlet steam. The highly pressurised steam is then inputed to turbine.The rotation of the rotar of turbine results in energy formation .The leftover steam is the passed through the condensor and thus the pure water is then produced as output. This paper also mainly reviews basic principles of the solar pond and the problems encountered in its operation and its maintenance .It is a renewable source of energy. Since last few year solar pond has made tremendous progress. The waste and impure water is used as input . By the help of Rankine cycle process a turbine is connected to the inlet steam. The highly pressurised steam is then inputed to turbine

Index Terms:. *Rankine cycle, Solar Pond, Eco-friendly, condenser.*

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1. INTRODUCTION

The Solar pond is a body of water that collects solar energy. Anderson reported a similar lake in Oroville (Washington State) where a temperature of 50 ◦C at a depth of 2 m was observed in the summer season. This phenomena has been observed and reported also by Wilson and Wellman [2], Hoare [3], Por [4], Melack and Kilham [5], Hudica and Sonnefeld [6] and Cohenet al. [7].In this paper, various designs of solar pond have been discussed. The factors affecting the thermal performance of the solar ponds, mode of heat extraction and its applications are reviewed. In order to improve the performance of the conventional salt gradient solar pond(CSGSP), the concept of the advanced solar pond (ASP) was introduced by Osdor [20]. There are two main features that distinguish the ASP in comparison with the CSGSP:(i)the over-all salinity of the pond is increased, and (ii) an additional (stratified) flowing layer is established in the lower part of the gradient zone(GZ). Increased salinity is proposed primarily for the surface layer in order to reduce evaporative heat loss; however, this requires the salinity in the rest of the pond to be increased as well. In order to maintain stability, the stratified flowing layer is used for additional heat extraction, similar to the flow that would be established in the lower convective zone (LCZ) for the same purpose

2. PRINCIPLE OF OPERATION AND DESCRIPTION

A solar pond is a mass of shallow water about 1 or 2 metres deep with a large collection area that collects water ,which acts as a heat trap. It contains dissolved salts to generate a stable density gradient on which the heat is then incident . Part of the incident solar radiation entering the pond surface is absorbed throughout the depth and the remainder which penetrates the pond is absorbed at the black bottom and the temperature rises. If the pond were initially filled with fresh water , the lower layers would heat up, expand and rise to the surface. Because of the relatively low conductivity ,the water acts as an insulator and permits high temperature to develop in the bottom layers . At the bottom of the pond , a thick durable plastic layers liner is laid. Materials used for liners include butyl rubber, black polyethylene and hypalon reinforced with nylon mesh. Salts like magnesium chloride, sodium chloride or sodium nitrate are dissolved in the water , the concentration varying from 20 to 30 percent at the bottom to almost zero at the top.

3. SOLAR POND APPLICATION

1. Heating and Cooling of Buildings: Because of the large heat storage capacity in the lower convection zone of the solar pond large amount of water can be trapped or stored, it has ideal use for heating even at high latitude stations and for several cloudy days and maintains the high temperature within the building than the surrounding temperature

2. Production of Power: A solar pond can be used to generate electricity by driving a thermo-electric device or an organic Rankine cycle procedure in which a turbine powered by evaporating an organic fluid with great promise in those areas where there is sufficient insulation and terrain, this is a less expensive way of producing electricity as solar radiations are free of cost.

3. Industrial Process Heat: Industrial process heat is the thermal energy used directly in the preparation and of treatment of materials and goods manufactured by industry the waste water after the generation is ten compressed and then the pure water is obtained. This is used for various home applications.

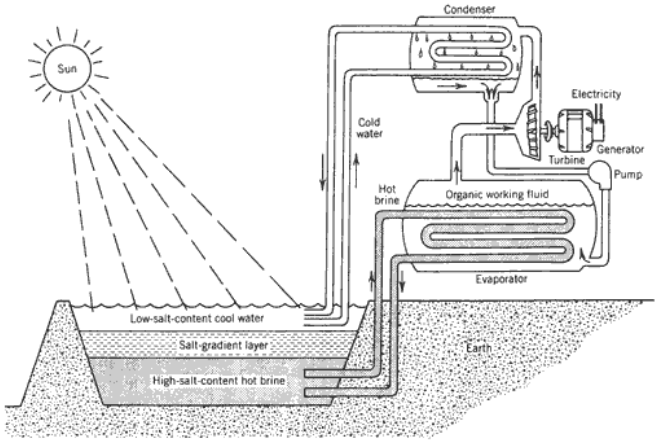

Fig-1: Solar pond and its applications

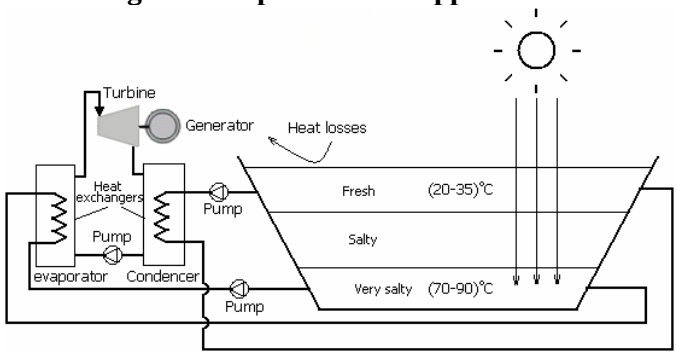

Fig-2:Electricity Generation

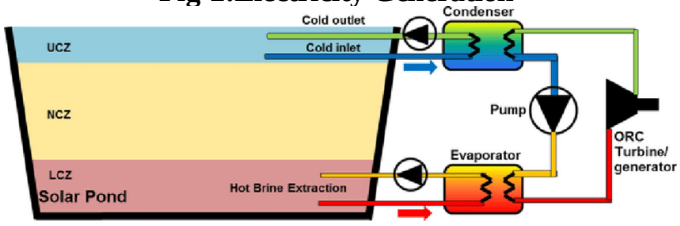

Fig-3: Solar Pond Connected To Condenser And Turbine

4. ADVANTAGES

1.It is a convenient source of electricity generation.

2.As the impure water is used as an input there is no wastage of water .

3. The impure water is then condensed and pure form of water is obtained .

4. It is economical as the setup cost is very low and no wastage of other vital resources .

5. Separate collectors of electricity is not required. The energy is direct supplied.

5. CONCLUSION

On the basis of the solar pond review, the following conclusions can be drawn:

(i) The temperature, salinity and density of water areas are almost constant. Whereas, in NCZ they are increasing with depth.

(ii) Non salt solar ponds such as membrane stratified ponds and shallow solar ponds, are more suitable for short-term energy storage because the temperature rise of the pond water is rapid.

(iii) The annual average values of the daily productivity and efficiency of the still with the shallow solar pond were found to be higher than those obtained without the SSP by 52.36% an d43.80%, respectively.

(iv) The number of surface-insulation layers is increased, the radiation-collection performance deteriorates while the heat-storage performance is improved.

(v) The change of the gap spacing between the upper film of the water bag and the glazing of the shallow solar pond does not significantly improve the performance of the pond.

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