









experiment at any particular time considered is obtained in case 3 experiment using zig-zag arrangement.

**K.K. Chong et al [10]** discuss optical analysis, experimental study and cost analysis of the stationary V-trough solar water heater system are presented. The novel stationary V-trough solar water heater with the maximum solar concentration ratio of 1.8 suns has been proposed to improve the thermal efficiency of the whole system. The advantages of the new proposal are that easy to be fabricated, cost effective and high thermal efficiency. The collected data has shown that the prototype has achieved the optical efficiency of 70.54% or 1.41 suns and the temperature of 85.9 °C. The prototype can be easily constructed through DIY using off-the-shelf materials with total cost of RM 1489.40 and total payback period of 12.2 year for discounted form or 8.9 years for undiscounted form.

**S. Sathishkumar et al [11]** paper summarizes the previous works on solar water heating systems with various heat transfer enhancement techniques include collector design, collector tilt angle, coating of pipes, fluid flow rate, thermal insulation, integrated collector storage, thermal energy storage, use of phase change materials, and insertion of twisted tapes. This paper also discussed the methods to optimize and simulate the solar water heating systems to understand flow and thermal behavior in solar collectors that would lead to the improvement of the thermal performance of solar collectors.

The enhancement of heat transfer in the solar collector with twisted tape is found to be better than the conventional plain tube collector. In solar water heating systems twisted tape has been used as one of the passive techniques to augment the heat transfer. Twisted tape has been used in heat exchangers but their applications are limited in solar water heating systems.

## 5. Conclusion

At Present, Solar water heating systems are installed with different configurations and arrangements. The basic technology concrete of these systems are studied and it is found that there is a need to work on the generated design procedure to select, install and monitor the solar water heating system as per the availability.

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