## ENHANCEMENT THERMAL EFFICIENCY OF PTSC BY USING NANOFLUID

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The parabolic trough solar collector (PTSC) is the most widely used concentrating solar technology in the world. The traditional PTSC is used in a variety of low- and high-temperature applications. PTSC consists of a reflective surface, an absorber tube, and a working fluid that passes through the tube. An absorber tube is located at the focal line or focal point of the reflectors.

PTSC absorbs solar radiation and converts it to heat energy, which can be used to heat water, air, or oil. Working fluid thermal energy can be used for several applications (Nasruddin et al., 2016). In PTSC, working fluid is one of the most important elements in the photothermal conversion process. The high photothermal efficiency of the fluid greatly depends upon its thermophysical properties.

The aim of this research is to increase the thermal efficiency of PTSC by using the nanofluid as a working fluid. Furthermore, it remains to be studied how the working fluid effects the heat transfer collector. Because of its superior thermophysical properties compared to conventional working fluids like water, ethylene glycol, and oil, nanofluid has gained attention as a new and efficient heat transfer fluid (Al-Rabeeah et al., 2022).

Thermodynamic behaviour is the most significant factor in the hybrid solar thermal collector systems (PV/T), which starts from the environment into the PV/T layers. As shown in the figure below, some PV/T modules are designed and structured with and without a glass cover. This study examined the impacts of the glass covering on the thermal and electrical performance of the hybrid solar collector.



There are two primary methods for preparing nanofluids: the one-step method preparation process and the two-step method preparation process. The one-step procedure creates and disperses particles in fluid. This method avoids dispersion, transport, storage, and drying of nanoparticles, reducing agglomeration and boosting fluid stability.

The two-step method involves the producing nanopowder and dispersing it in a base fluid. Firstly, nanopowder is obtained through inert gas condensation, chemical vapor deposition, or mechanical alloying. Then the nanopowder is mixed with the base fluid using ultrasonic agitation. The table below shows the calculation results.

|  |  |  |
| --- | --- | --- |
|  | on-off | flow rate control |
| η, % | 42,43 | 48,03 |
| ST, - | 19,87 | 32,65 |
| noTr, % | 70,57 | 96,72 |

Mixing of nanoparticles to the working fluid is an effective method to increase the thermal energy collected and the thermo-physical properties of nanofluid such as the enthalpy, specific heat capacity, thermal conductivity and density.

Furthermore, different nanofluid types are being examined to optimize the performance of PTSC. Therefore, advanced composites (new nanofluid types) for better heat transfer and enhanced absorptivity need to be explored (Minnaert, Burgelman, 2007).

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