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Renewable Energy, A Tube Solar Collector using Nanofluids

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In both power generation and other energy sectors, renewable energy is gradually becoming an alternative to fossil fuels. From an economic sense, the cost of renewable energy is the least expensive for every unit of energy harvested. Solar energy is one of the best alternatives to fossil fuels, and research on solar collectors is gaining significant attention in energy producing where, by harnessing the power of the sun, we may minimise our heavy reliance on fossil fuels. The performance of parallel-type (PT) Evacuated Tube Solar Collectors (ETSC) using aluminium oxide (Al2O3) nanofluid is investigated experimentally. The solar collector is used during both peak and off-peak hours. As a result, the ETSC's efficiency is determined by incorporating various amounts of Al2O3 nanoparticles into the base fluid. The working fluid circulation is set to be at 0.035 kg/s and 0.065 kg/s. The solar collector's highest efficiency is 61.8%, 65.4%, and 69.5% at a flow rate of 0.035 kg/s with nanofluids concentrations of 0.15%, 0.2%, and 0.3 vol% of Al2O3 nanofluid, respectively. When compared to the flow rate of 0.065 kg/sec, efficiency improvement of 6.7%, 7%, and 7.7% are attained. When compared to different percentages of nanofluid and water, the most optimal concentration of 0.3 vol% Al2O3 nanofluid showed improvement in thermal efficiency. Introduction of Al2O3 nanoparticles into the base fluid improved the efficiency of the evacuated tube solar collector. The temperature of the entrance and exit fluids, solar radiation, ambient temperature, energy generation, and collector efficiency will also be investigated. The research also sought to determine the efficacy of PT-ETSC under various environmental conditions. Finally, based on the findings of the experiments, the current research might be useful for the application sector in agriculture, notably in the drying of vegetables.

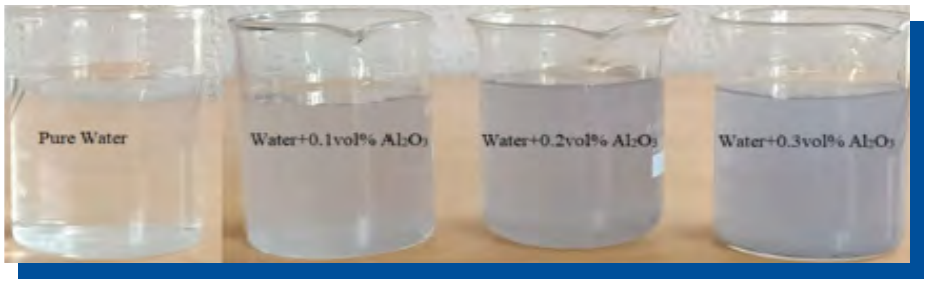

Figure 12. Pure water and nanofluids (Sasikumar, M.M.Noor et. al, 2020)

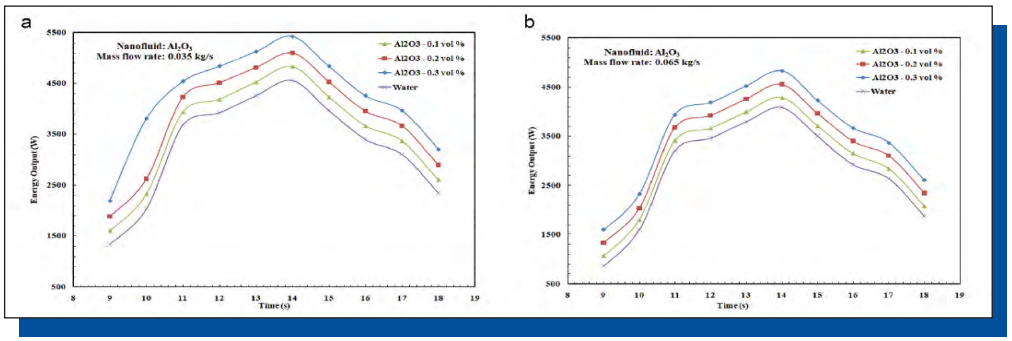

Figure 13. (a) Time vs energy output of PT-ETC at MFT of 0.035 kg/s. (b) Time vs energy output of PT-ETC at MFT of 0.065 kg/s (Sasikumar, M.M.Noor et. al, 2020).